
LUT
University

Exercise 4 Tutorial: Travel luggage

Exercise 4 task:
This individual exercise 4 is the last individual exercise that required using of SolidWorks, your tasks is to model travel luggage of yours, or you can search technical documentation online and model similar travel luggage. After experience on individual exercise 1, 2, 3, group exercise 1, you should be able to model different objects using different features. We will not provide step-by-step tutorial in this individual exercise 4 tutorial, however, a tutorial link provided by Tomi Suikkari will be provided.

Contact (**Questions should be asked right after lecture and during the exercise sessions**):
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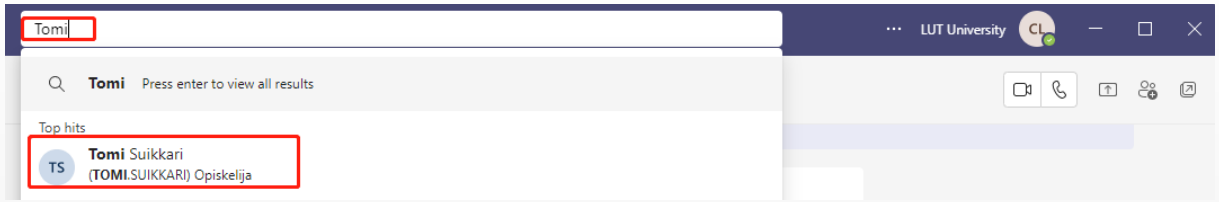


Exercise 4 Tutorial: Travel luggage

In this exercise we are going to model travel luggage.

Methods:
1. **Review** instructions of individual exercise 1, 2, and 3
2. If you have your own travel luggage, **measure** the dimension, if you do not have, **search** internet for the dimension, and make estimation on different components
3. **Model and assemble** different parts into final travel luggage model

Goal:
1. Able to **understand** different basic features in SolidWorks
2. Able to **model** and **mate** parts into assembly model
3. Able to **make analysis** (Static/Sustainability)

Grading of individual exercise 4

Grade 0:
You model something that we can model in 1 minute

Grade 1:
You model something and we can identify that this is a travel luggage

Grade 2:
You model basic travel luggage (no obvious modeling mistakes such as no modeling conflict, assembly, materials, part drawings, assembly drawings, etc.)

Grade 3:
You use provided travel luggage file (materials and some dimensions are changed), or you model your own model, then to make analysis, required files (PDF include above mentioned drawings, zip files)

Grade 4:
The new model is well built, and it is flexible (the wheel can rotate, the handle can be pulled out, luggage can be opened, and you put different configurations in PDF as screenshot), then the analysis is done, submission requirements are the same as previous

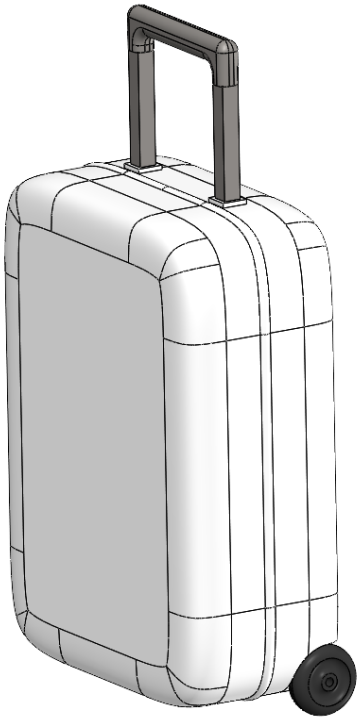
Grade 5:
Totally new model is built, (drawing and report, to show the function of the luggage, referred to different manufacturer user manual) reach the high level, such as materials are well investigated, the model is rendered, etc.

If you have luggage, please measure the dimension and make model

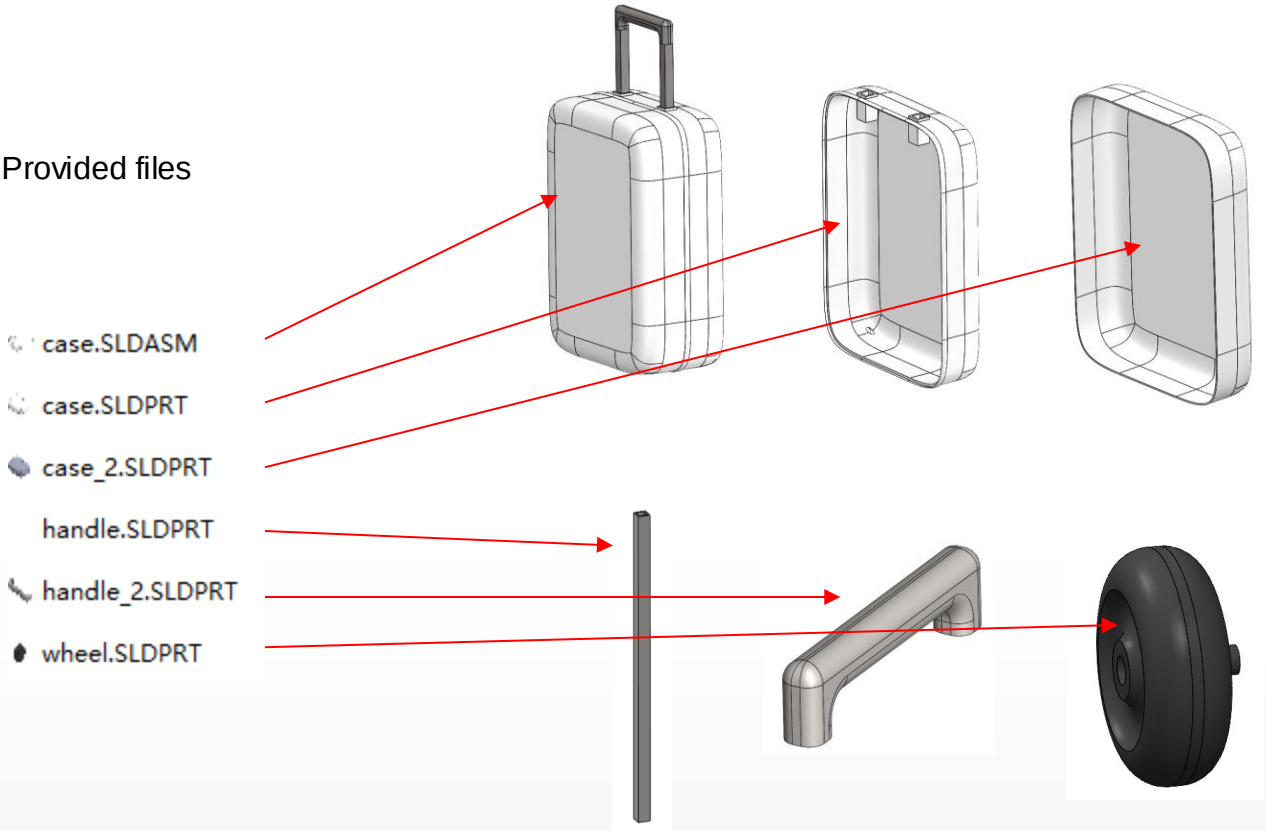
If you do not have luggage, here are some suggestions on designing it

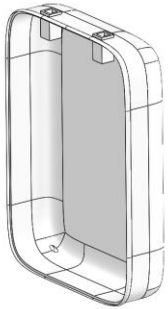
1. Tomi Suikkari made video tutorial of this luggage modeling step by step

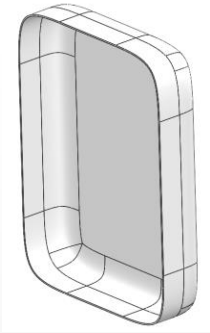
https://www.youtube.com/watch?v=pdYWSnn-qPg&ab_channel=tomisuikkari



2. Provided files





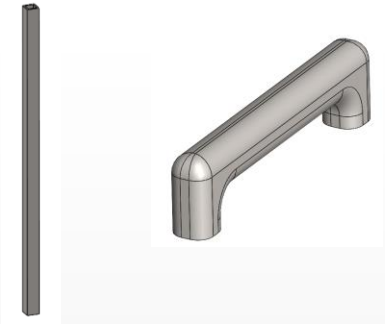


3. The modeling of these two cases are almost the same as individual exercise 1, model phone cover

Extruded Boss – Extruded Cut - Fillet

4. The modeling of wheel is almost the same as individual exercise 2, model bottle

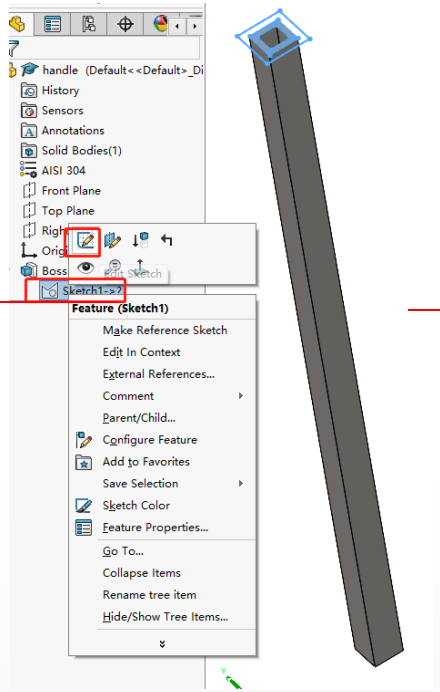
Extruded Boss – Extruded Cut - Fillet

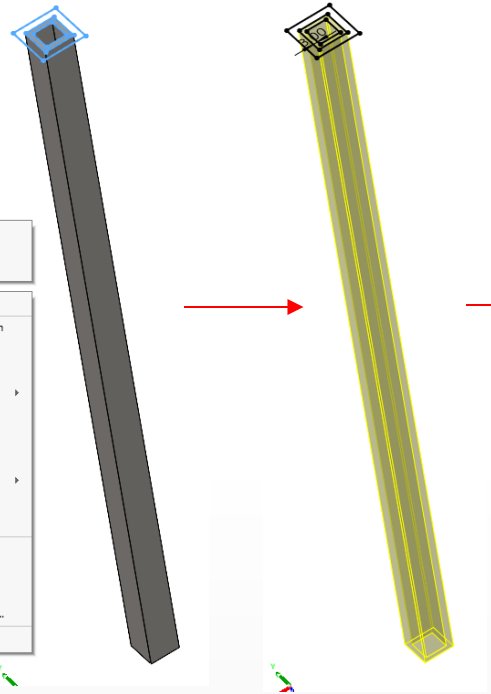


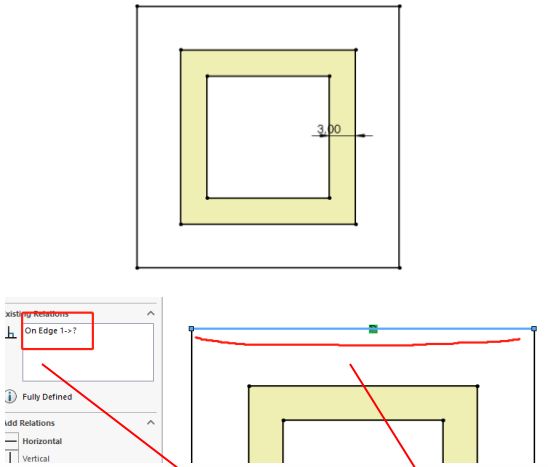
5. The modeling handle is simpler as before, you can even open the file and edit on it

How to modify component

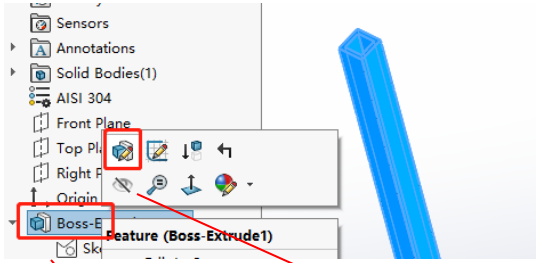
6. Right click “Sketch”, then left click “Edit sketch”





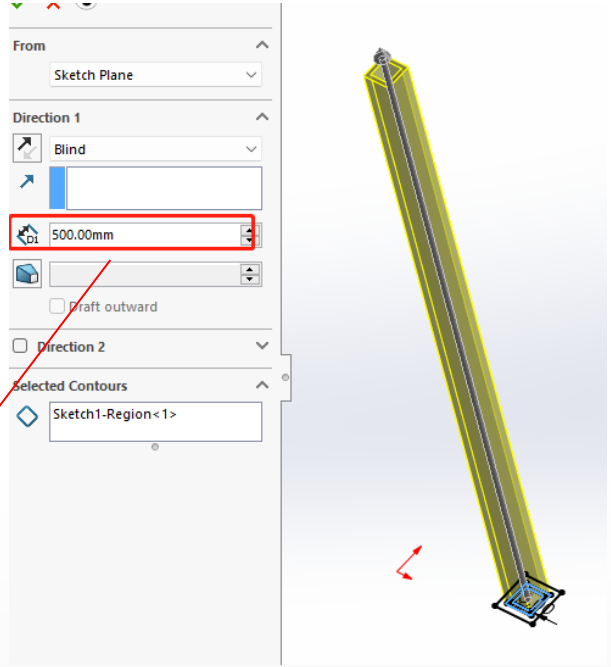


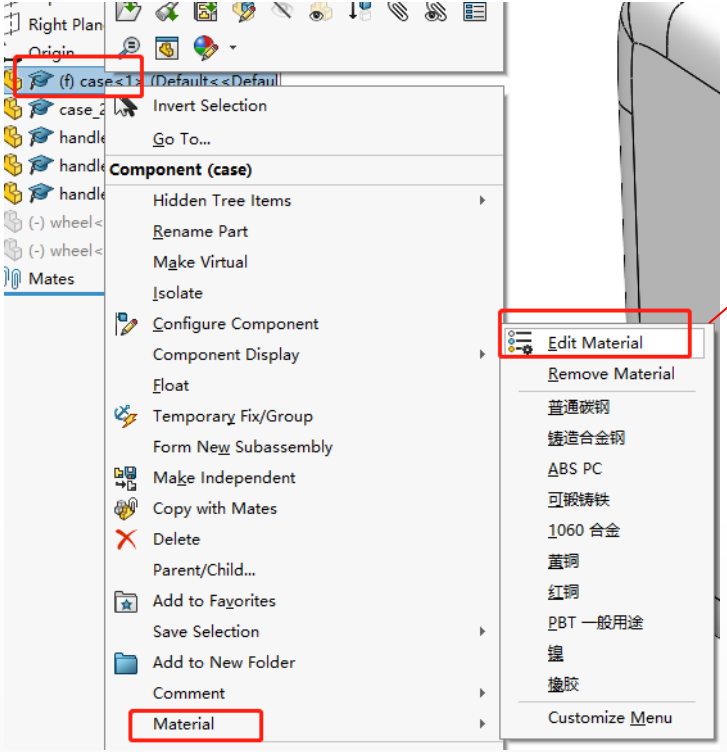
7. Then you can edit, but you need to delete some relations here by **Click** line, then find relation and **Delete**



8. Right click “Feature”, then left click “Edit feature”

9. Then you can change the length in this case

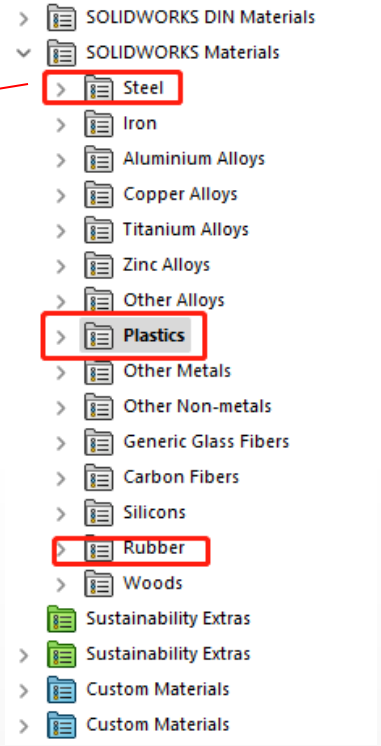




10. Right click the part

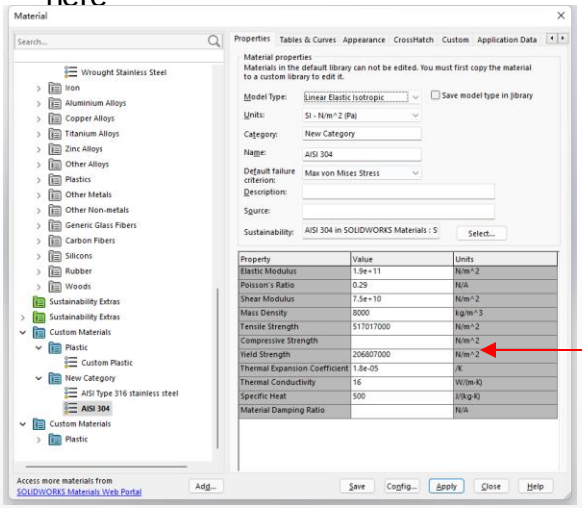
Then select “Edit Material” from “Material”

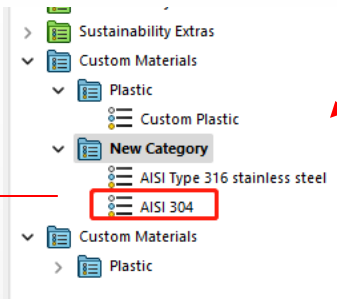
For example
Handle – Steel
Case – Plastics
Wheel – Rubber

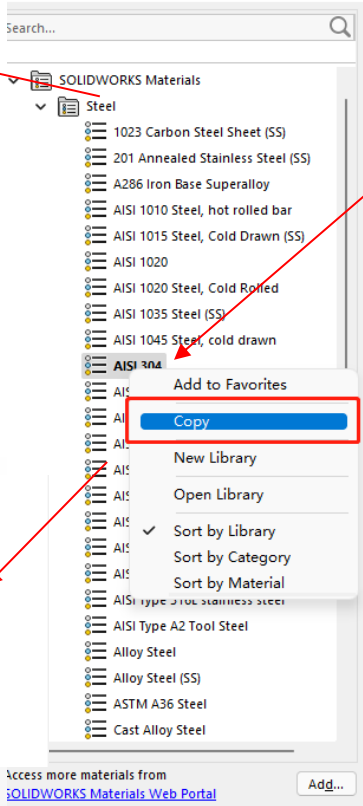


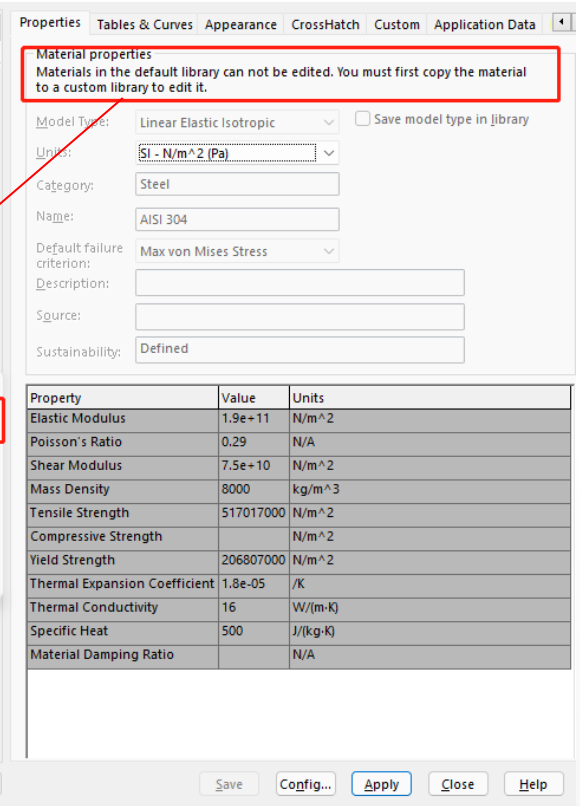
Material database editor:
Here AISI 304 is used as example, different properties are shown here, and you can also search property in Google, and you can easily find it, but please pay attention to the unit

In the later Static/Sustainability analysis, if the simulation fails, if the problem is caused by material, please check the material that you assign to the part, and check which property is missing, then search it in Google, then type it here

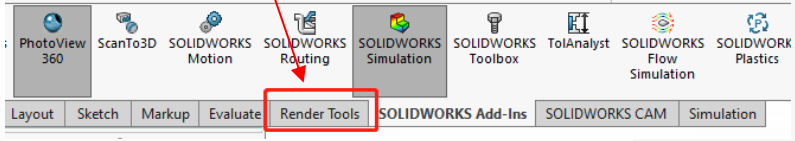


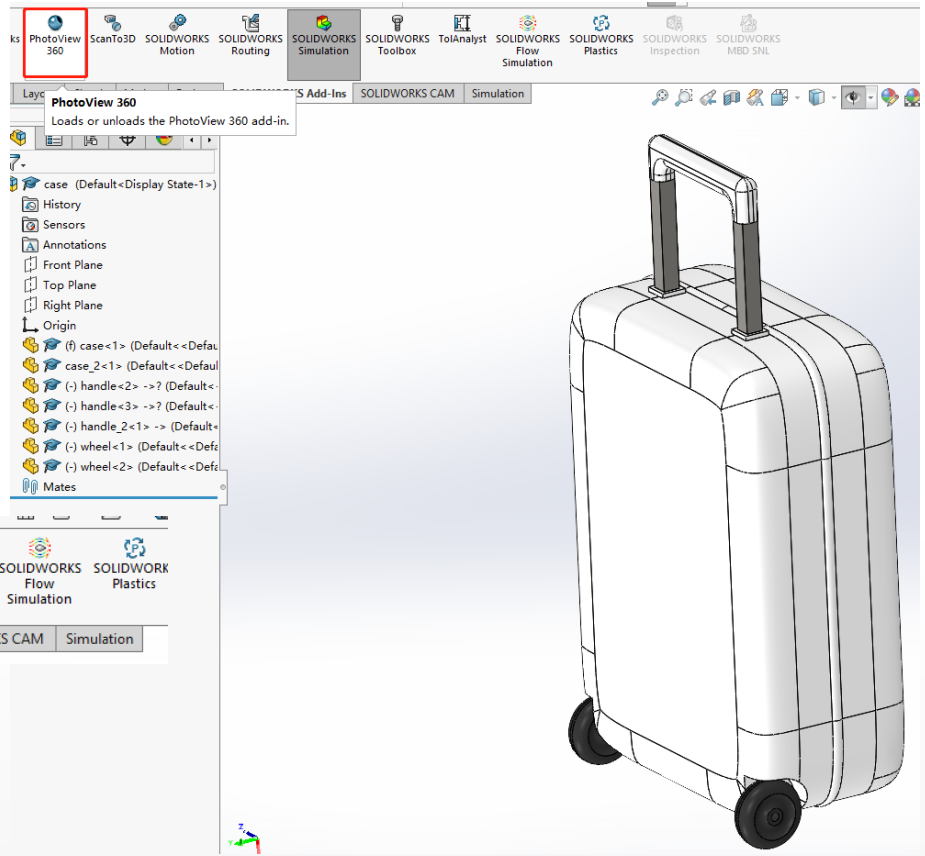


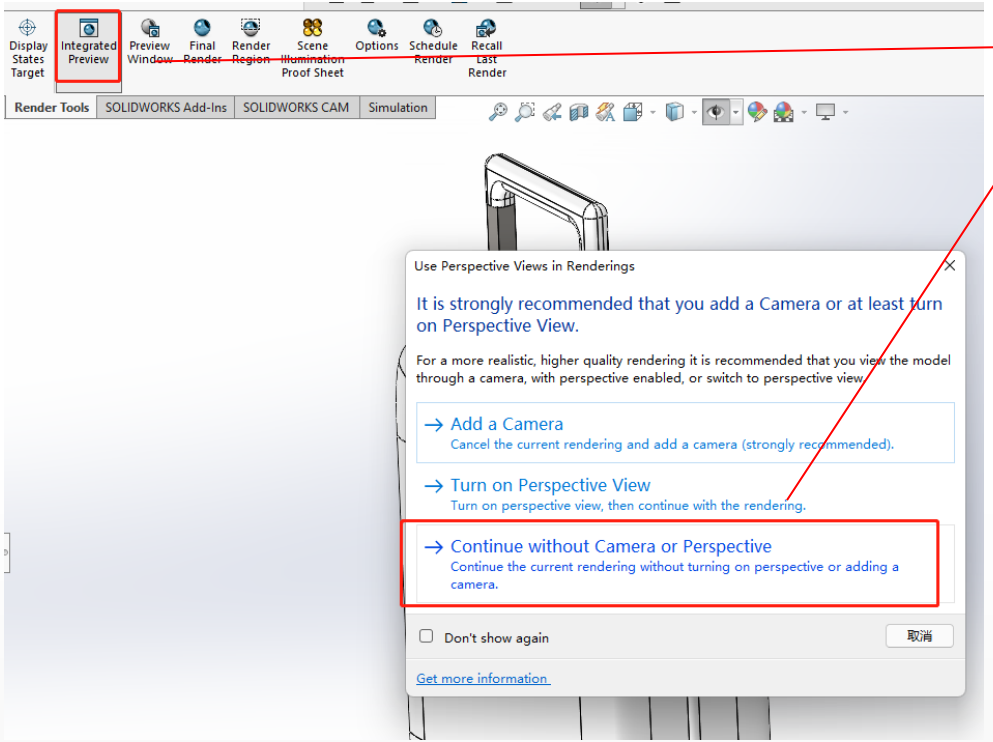




11. You can render the model by firstly clicking “PhotoView 360” in SOLIDWORKS Add-Ins tab and then click “Render Tools”







12. Then click “Integrated Preview”, and click this option, there is advanced option by setting camera, but in this tutorial, we do not struggle with it, the preview is shown here

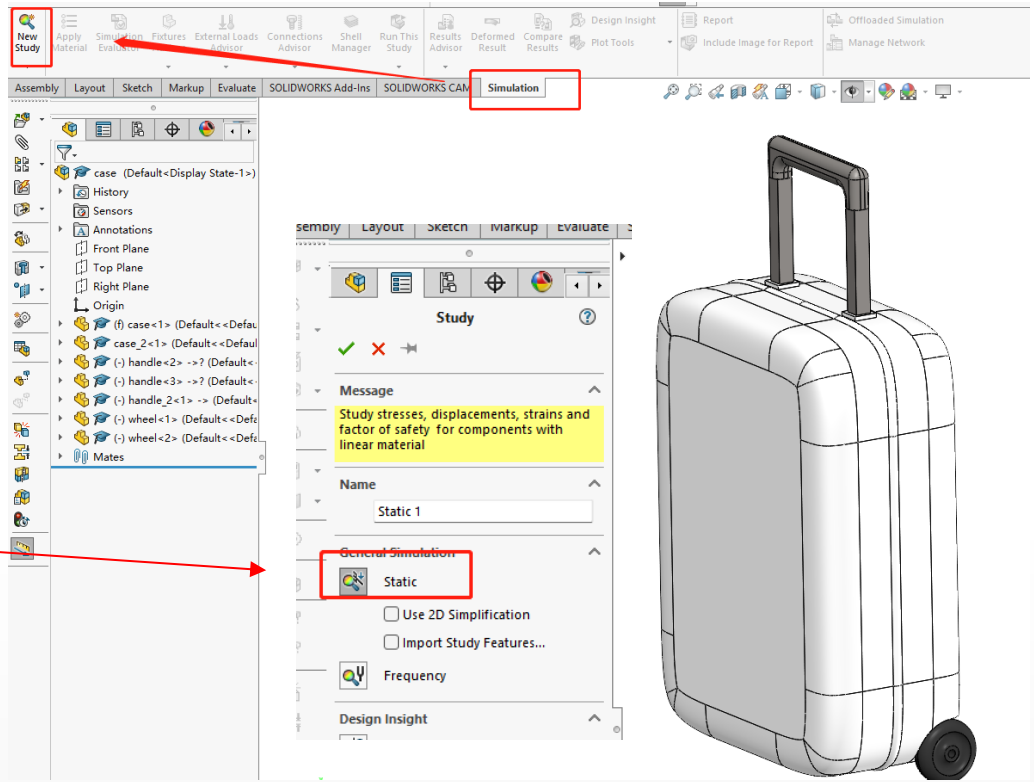
In the following sections, you can choose do one of the following:

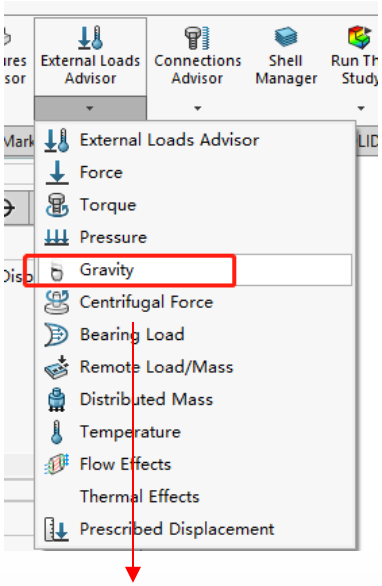
- Static analysis
- Evaluation of sustainability

Static analysis

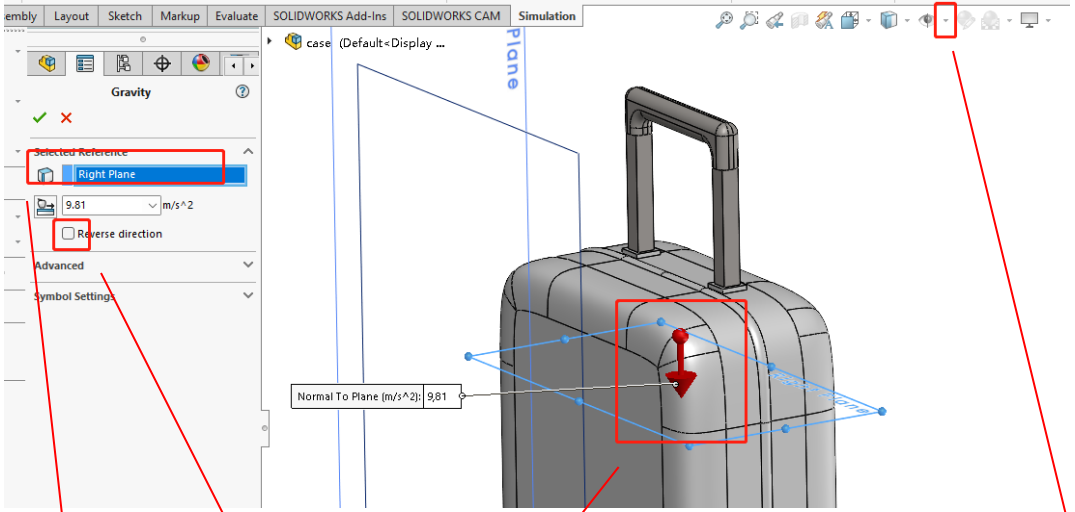
13. Click “New Study”

14. Click “Static”

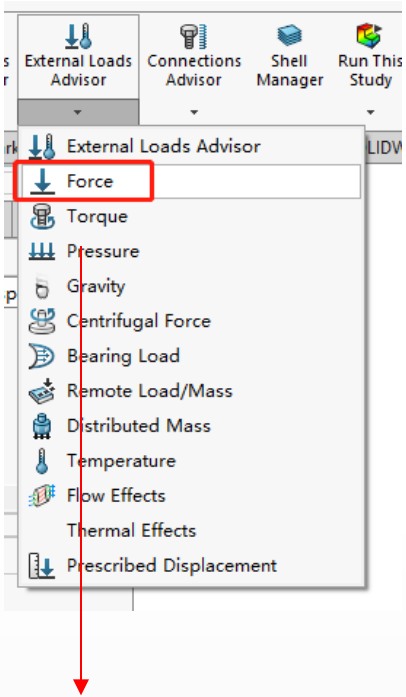




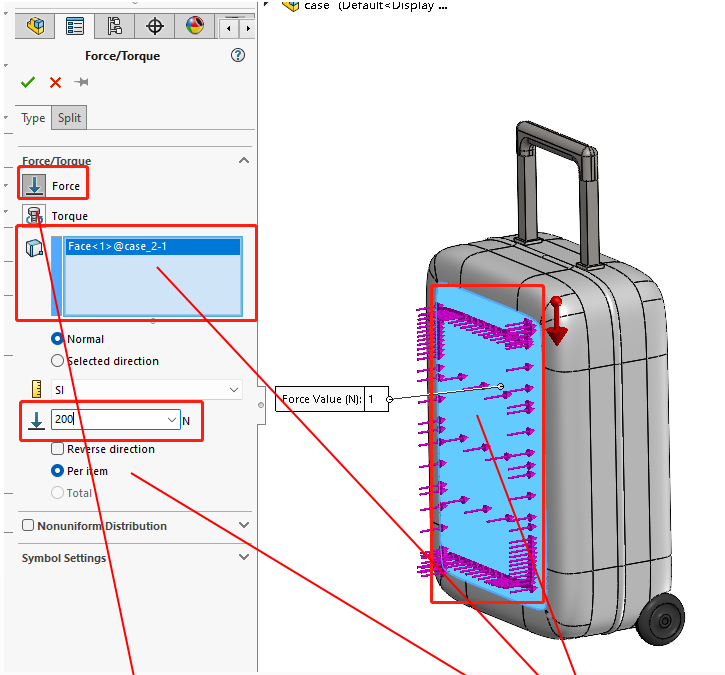
15. Click “Gravity”



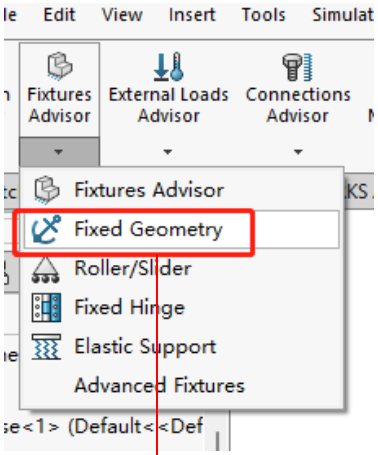
16. Set the direction of gravity **downward**, if the arrow is not shown as here, try to change the **Plane** and **Reverse direction**, if you do not see plane, then click the **Visibility** to show the plane



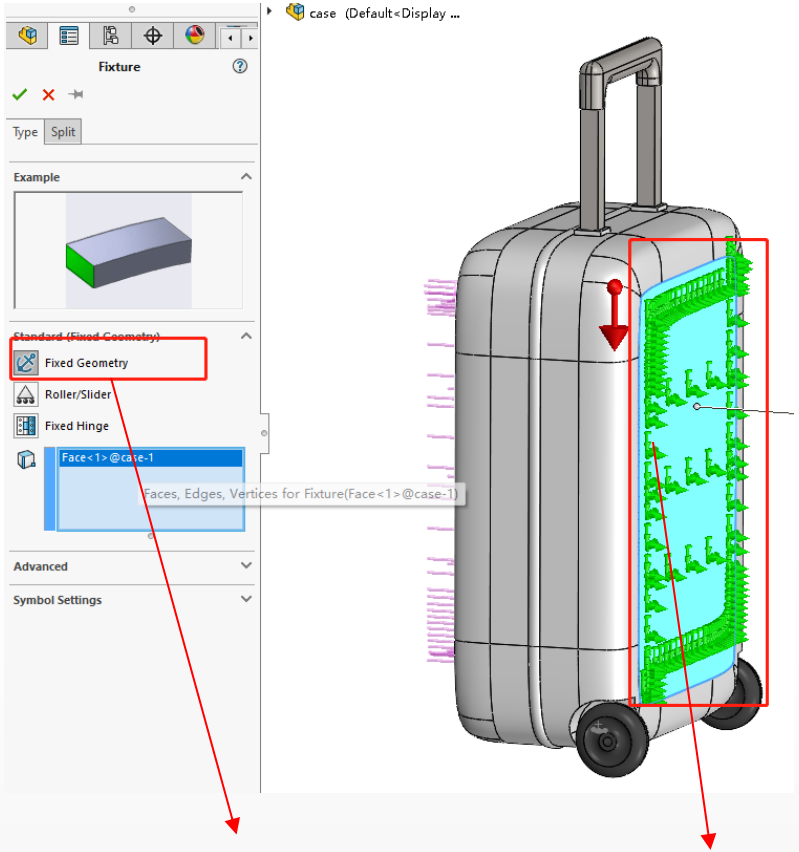
17. Click “**Force**”



18. Select “**Force**”, apply the force on the **Plane**, then the arrows show the force direction, then for example, we set force as “**200**” N, which is about 20 kg load applied on this surface

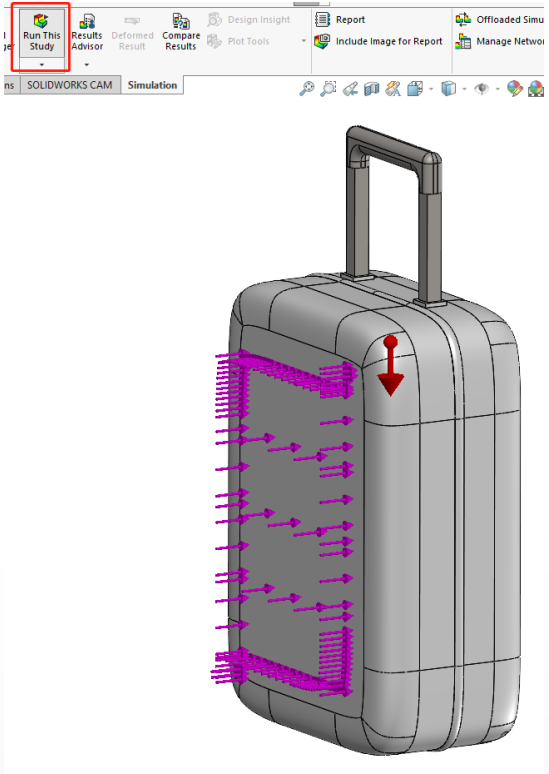


19. Click "**Fixed Geometry**", we will assume another surface is fixed



20. Select "**Fixed Geometry**", then choose the surface on the back

21. Click “Run This Study”



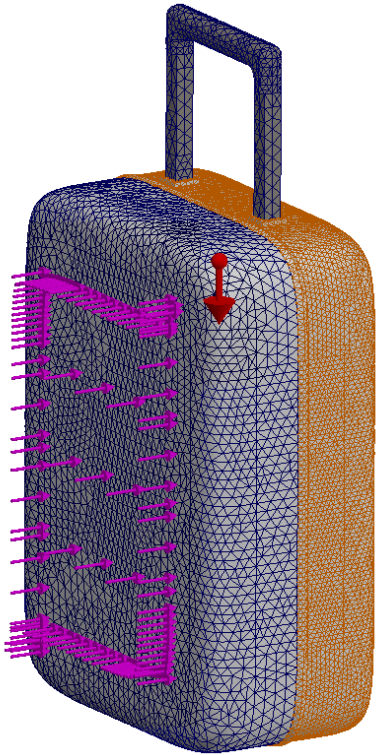
IMPORTANT (Problematic step):

SolidWorks is not for such static analysis purpose, ANSYS is more professional in such kind of work, SolidWorks can do some basic work if the structure is simple,

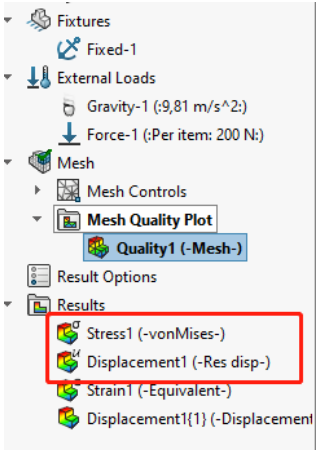
The setup of the static analysis is:

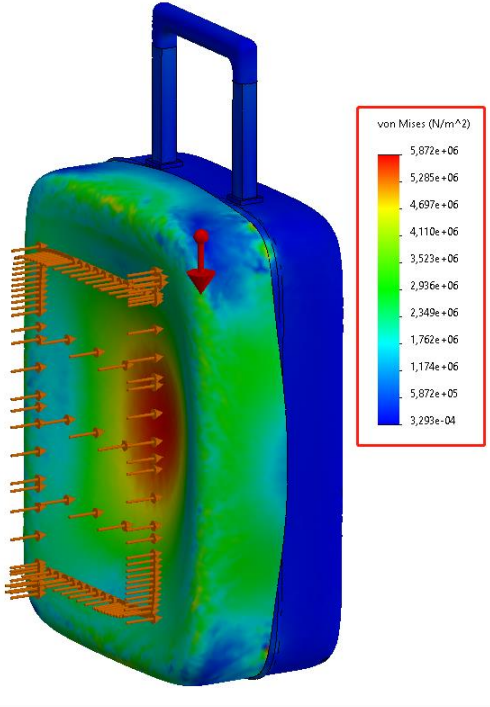
- Set support (fixed support in this exercise)
- Set load (200 N and gravity in this exercise)
- Generate mesh (mesh means make the structure into small pieces, then simple mathematic applies on each mesh, then the results accumulate together)

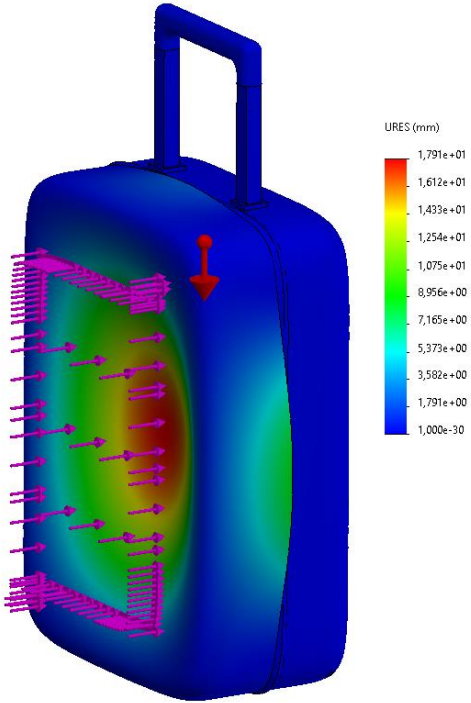
Here we use **Simplified** file without wheel, the original file will be provided to you. The complicated structure and fillet will make mesh fail in some cases, if there is any problem in this stage, do not be panic, try to simplify the model, if it still does not work, please go to lecture and ask us after lecture, or ask us in the exercise session, because this kind of problem is better solved by checking your model and show you the reason that cause the errors. We will answer your question in other time as well, but there might be delay since December is the busiest time in the year.



Mesh





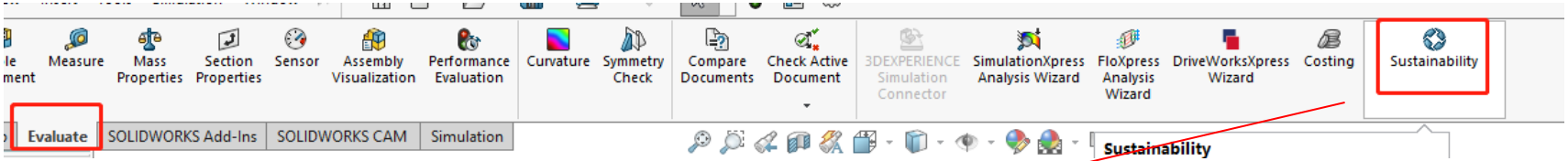


22. From the “Results”, you can check the stress and displacement
Displacement is easy for you to understand, which shows if you put some 20kg weight on the surface, then the middle (red color) area will be deformed for 17.91 mm towards inside.

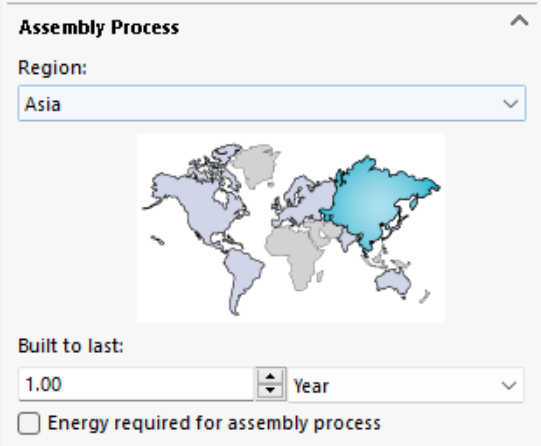
If you choose **Static analysis**, write 1-2 pages Word report, to take screenshot, write down what parameters (materials, load, load position, support position) you used, and how you analyze and understand the results.

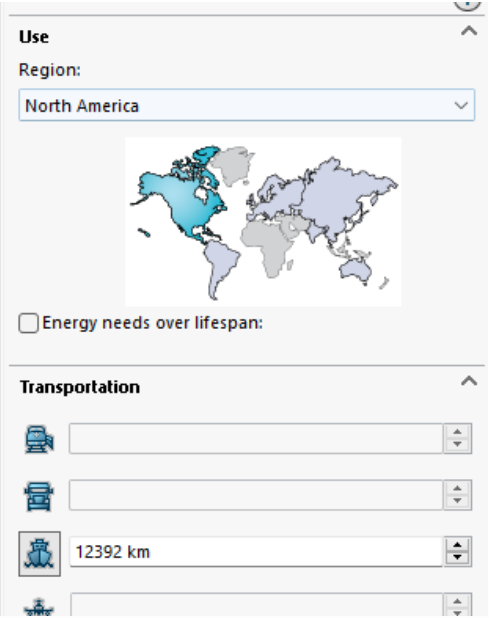
Evaluation of Sustainability

Youtube link of Sustainability:
https://www.youtube.com/watch?v=1l6xX7k7cpU&ab_channel=SolidSolutions-ProfessionalDesignSolutions

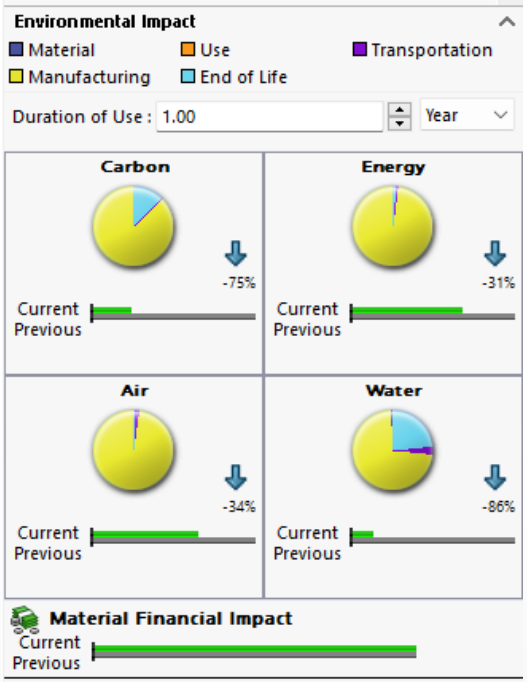


23. Click “Sustainability” from “Evaluate”





24. Then you can input different data here from your estimation:
- If you did not choose materials before, you can choose here
- Where the assembly process is taken
- Where the product will be used



25. Then you can see the estimated environmental impact:
- Carbon
- Energy
- Air pollution
- Water consumption

26. If you choose **Evaluation of Sustainability**, write 1-2 pages Word report, to take screenshot, write down what parameters you used (Materials and other input parameters), and how you analyze and understand the results.

Exercise 4 Tutorial: Travel luggage

Summary:
In this individual exercise 4, you should be able to used features learned from previous exercises to model a travel luggage and make analysis using some simple features in SolidWorks.

Requirement:

- **Review instructions** of individual exercise 1, 2, and 3
- **Model** the travel luggage
- **Make analysis**

Exercise 4 Tutorial: Travel luggage

Submission:

You should submit 1 Zip file and 1 PDF file (there will be file amount and format restriction in Moodle to standardize the submission procedure):

- **Zip file** of the models (contains Part and Assembly files, you can pack and go or manually put all the files into one folder), **open the model again before the submission** to ensure the file you submitted is valid.
- **PDF file** contains:
  - Drawings contains
    - All the part drawings
    - Materials
    - Assembly drawing
  - Report of analysis
    - Static analysis/Sustainability