Final Project: Desk optimization (30')

1. Task

A desk needs to be optimized in accordance with the requirements in Part 2. The optimized design will be printed out using 3D printers, followed by loading tests under two conditions, shown in Fig. 1.
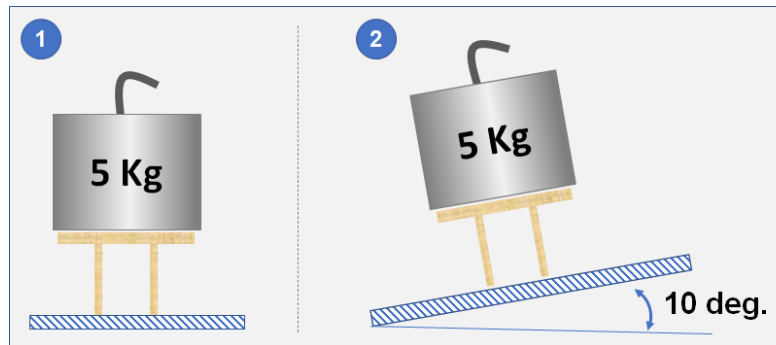

Fig. 1. Load case 1 (left) and load case 2 (right)

2. Requirements:

    a. Optimization domain is confined within the dimension of 100×100×100 mm, with 1) the desktop off the ground at least 80 mm; 2) material filling ratio= $\dfrac{\text{material filling area}}{\text{area enclosed by two legs}}$ < 50%. See Fig. 2.
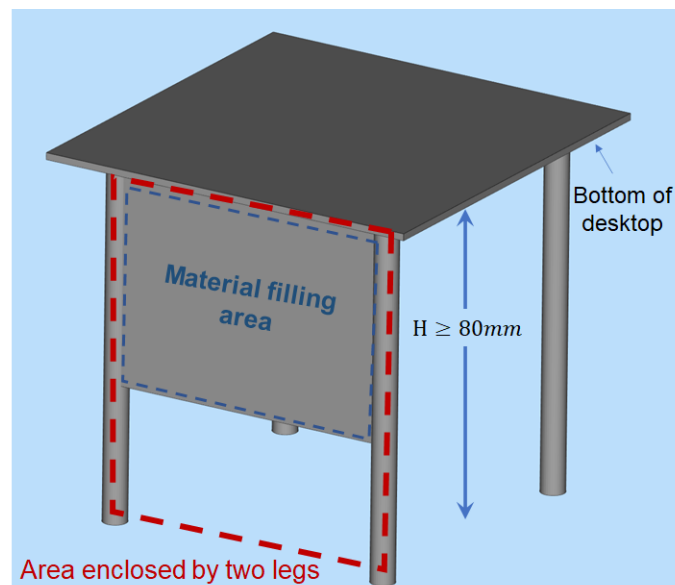

Fig. 2. Schematic diagram of Requirement a.

    b. The load unit in both loading cases is a cylindrical mass with a diameter of 100 mm. Therefore, the desktop cannot be too small; otherwise, it may not hold the mass in testing.

3. Marking scheme:

a. Final report (10' at max).
b. Passing Load Case 1 (12'),
c. Passing Load Case 2 (2').
d. For designs passing Load Case 1 &2, remaining scores (6') are credited according to desk weight. Full marks will be given to the lightest design.
e. Identical designs lead to the loss of 12 points.

Submission:

a. One 3D printed desk.
b. A final report including boundary conditions and main optimization process should not be longer than 1 A4 page.

Warm tips:

a. Designs can be either sent to tutors in the form of STL or printed by your own. For the former, due to large numbers of students enrolled in the course, only one-time printing is allowed. As for the latter, only PLA is allowed as the printing material.

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