DYDAKTYKA I TECHNOLOGIA

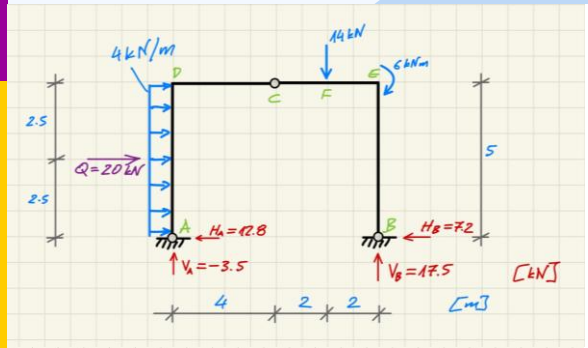
XI Conference eTEE Didactics and Technology, CeLiID AGH, CNE PG

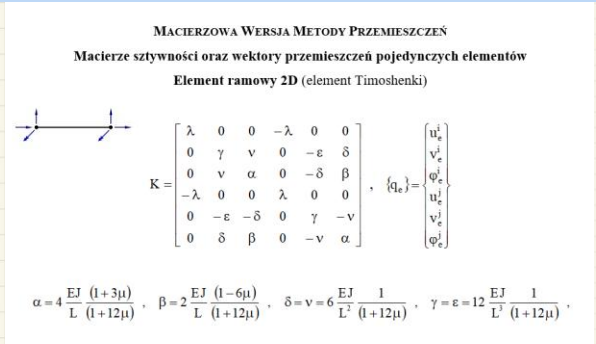
Teaching Structural Mechanics using Mola Structural Kit

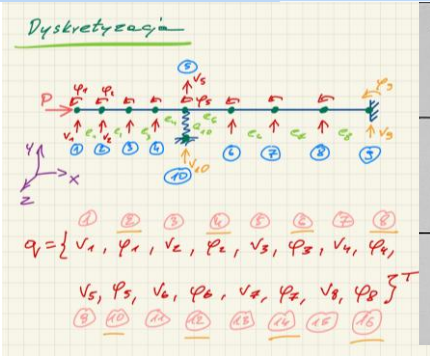
Mariusz Ruchwa, PhD, Eng.

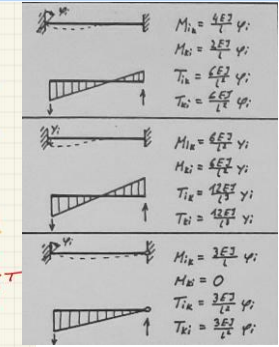
Cracow, Poland, 18-19.09.2025

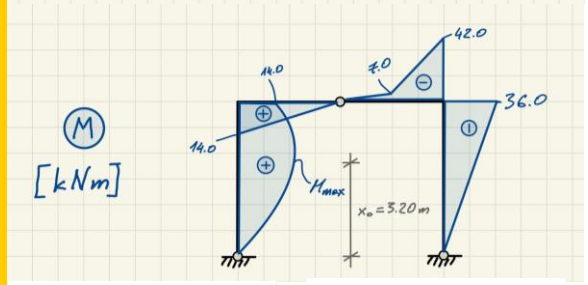
Structural Mechanics *– in other words, the many challenges associated with studying* ***Civil Engineering***

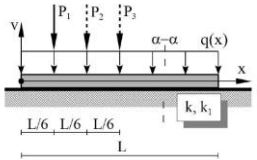


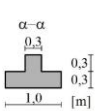










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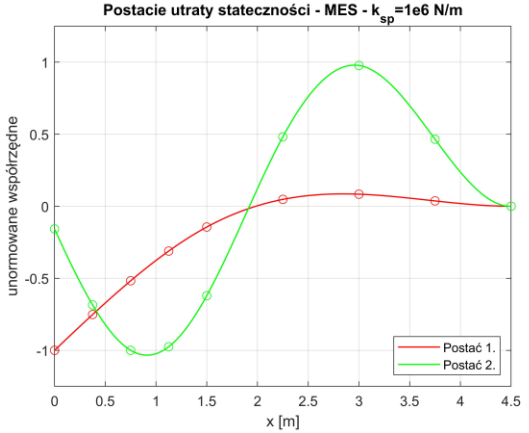
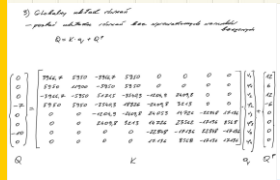
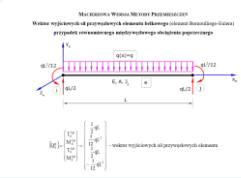
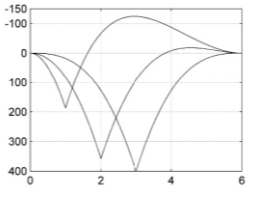




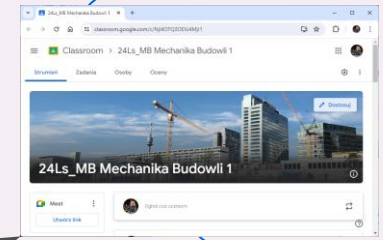


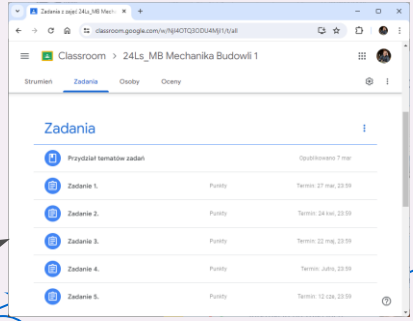


My classes: Task orientation and continuous interaction

(instead of a midterm exam)

Interaction in the internet space





Work during in-person classes and asynchronously using cloud computing, web services, modern computational tools, etc.

Interaction in classes and consultations

During class

Outside of class

In-person classes with remote learning support and task-based student work

YouTube

POLITECHNIKA GDAŃSKA | CENTRUM NOWOCZESNEJ EDUKACJI

Pt. Dydaktyczne Piątki

21 lutego 2025 r.

Jak bez kolokwium pracować ze studentami w przyjazny i efektywny sposób

Mariusz Ruchwa

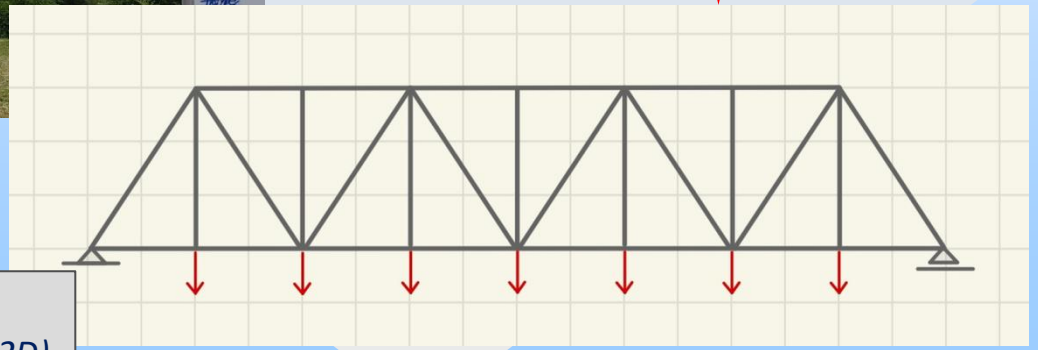
Nagranie szkolenia jest dostępne w serwisie YouTube

Structural Mechanics

– How else can we help students in their learning?

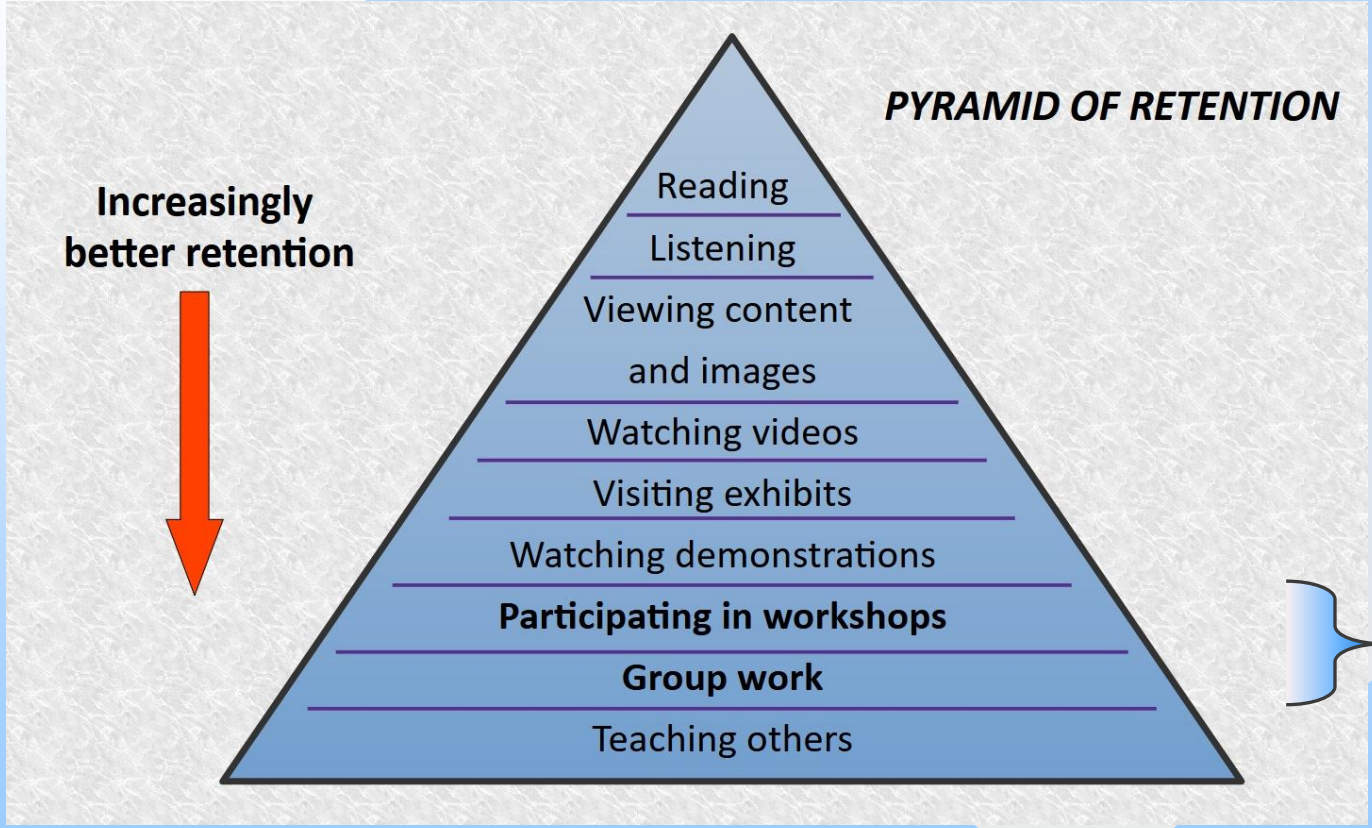
Real structure (3D)

3D <---> *2D* (?)



Static scheme
(structural analysis model)(2D)

Did Edgar Dale have it right?

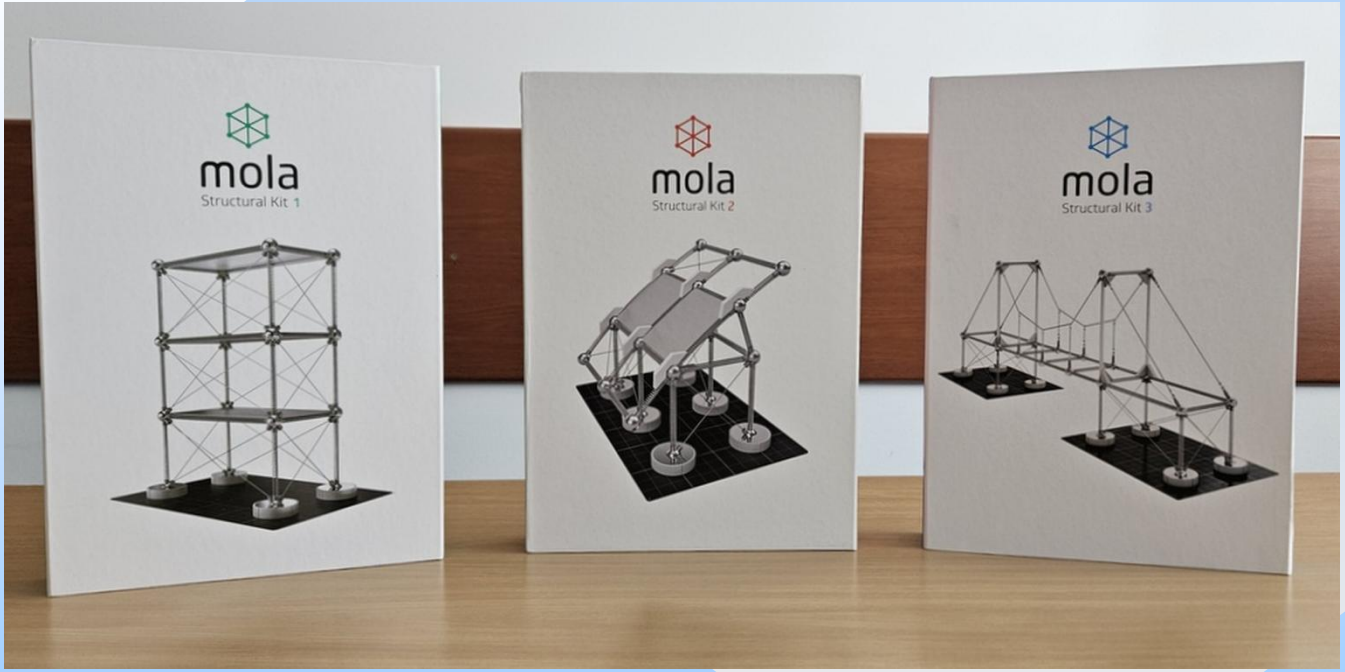


What besides slides, cloud computing, computers and other aids...,

to solve real problems with greater awareness

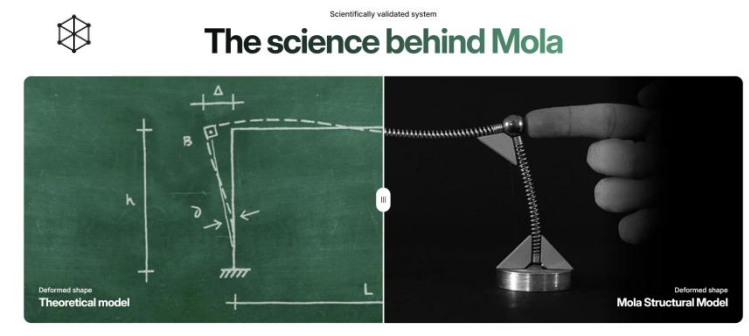
My additional work tools (the old ones)

And what was my dream and became a help...



Mola Structural Kit

Mola Structural Model



Mola Education Ltda.
São Paulo, Brazil
https://molamodel.com

Marcio Sequeira de Oliveira

UNIVERSIDADE FEDERAL DE OURO PRETO – ESCOLA DE MINAS
DEPARTAMENTO DE ENGENHARIA CIVIL
PROGRAMA DE PÓS-GRADUAÇÃO EM ENGENHARIA CIVIL

QUALITATIVE STRUCTURAL MODEL FOR PRE-EVALUATION OF THE BEHAVIOR OF METALLIC STRUCTURES

MÁRCIO SEQUEIRA DE OLIVEIRA

ADVISOR: Prof. Dr. Arlene Maria Sarmanho Freitas

Dissertation presented to the Graduate Program of the Department of Civil Engineering of the Escola de Minas at Federal University of Ouro Preto, as part of the requirements to obtain the title of Master in Civil Engineering, field of concentration: Metallic Construction.

Ouro Preto, August 2008

Mola Structural Kit

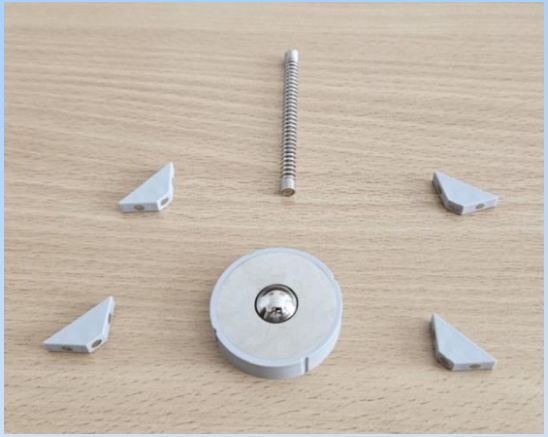
*What possibilities does **Mola Structural Kit** offer?*

Note and request for understanding

I apologize in advance to construction industry specialists,
especially those working in Structural Mechanics,
but due to the wide range of eTEE Conference participants,
I decided to forgo professional terminology and precise definitions so that
my message would be understandable to people outside the industry as well.

;-)

Supports



Pinned support

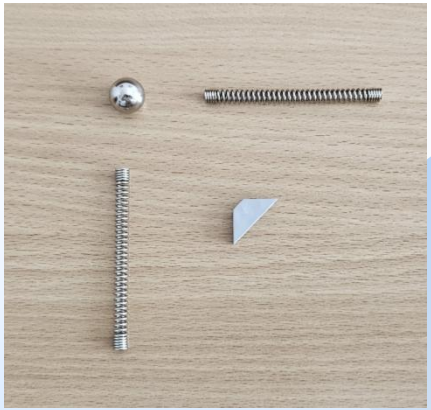
Rigid support

Structural connections

Pinned connections between two elements

Structural connections

Rigid connections
between two elements

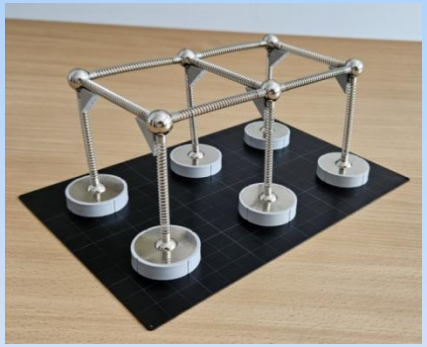


Structural connections

Various connection options for three elements

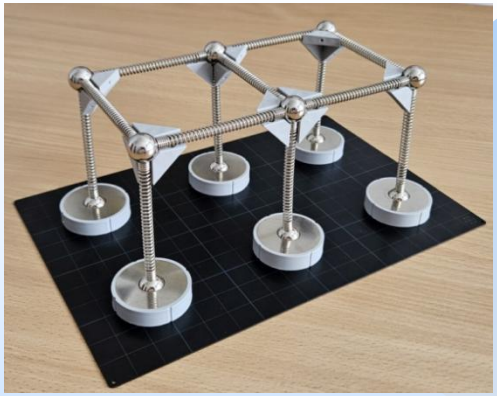
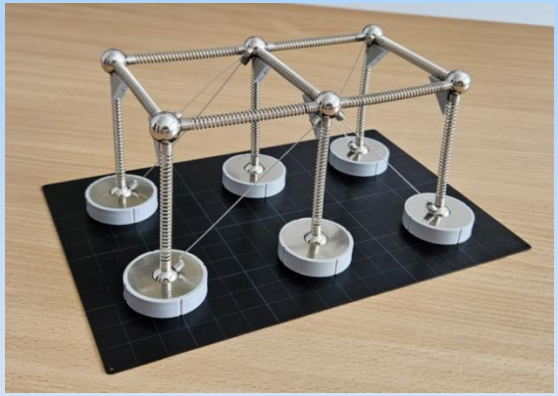
Problems with correct structural design

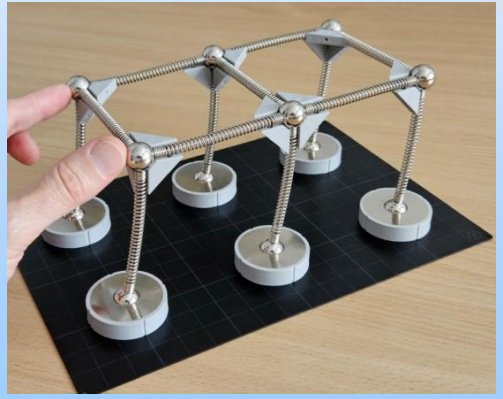
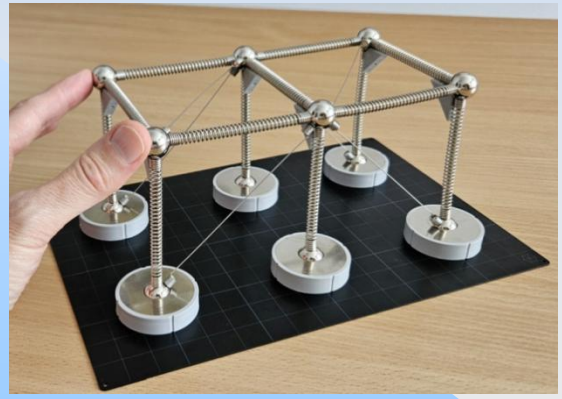
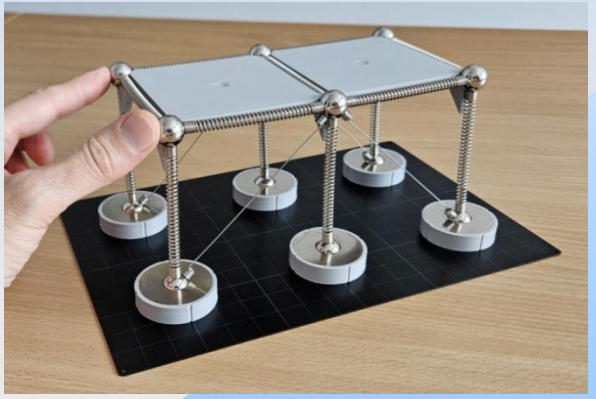





*Unfortunately, these are **not good** ideas*

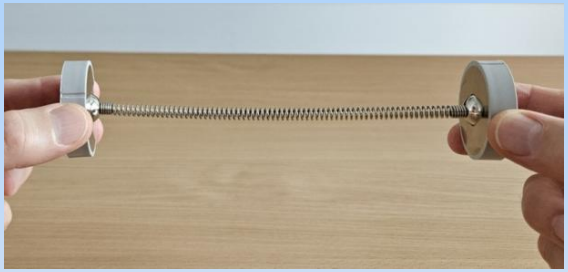
Problems with correct structural design

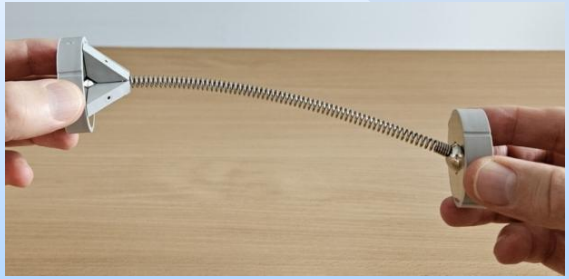



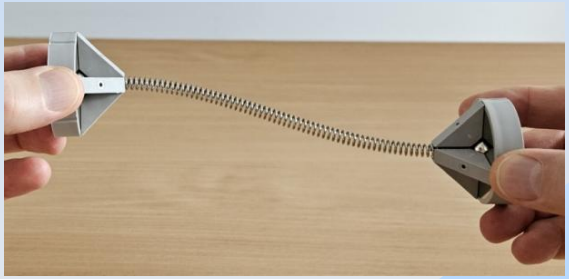




*These are **good** ideas*

Basic solutions in structural statics





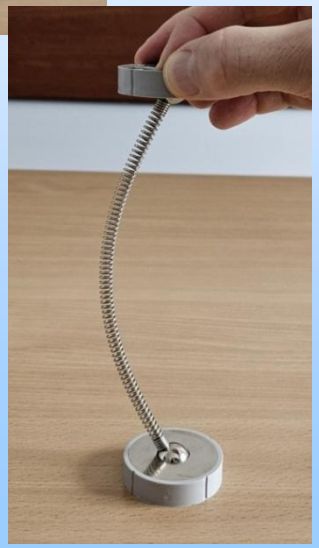

… the somewhat more complicated ones

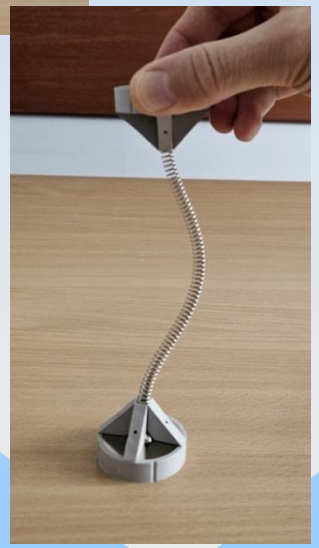
… and even more complicated …

Buckling – basic solutions



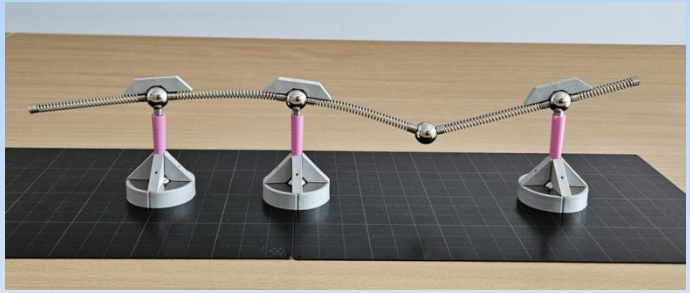




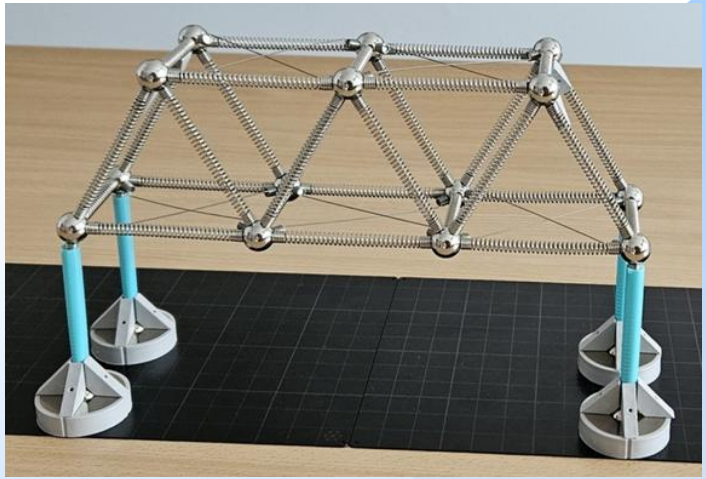


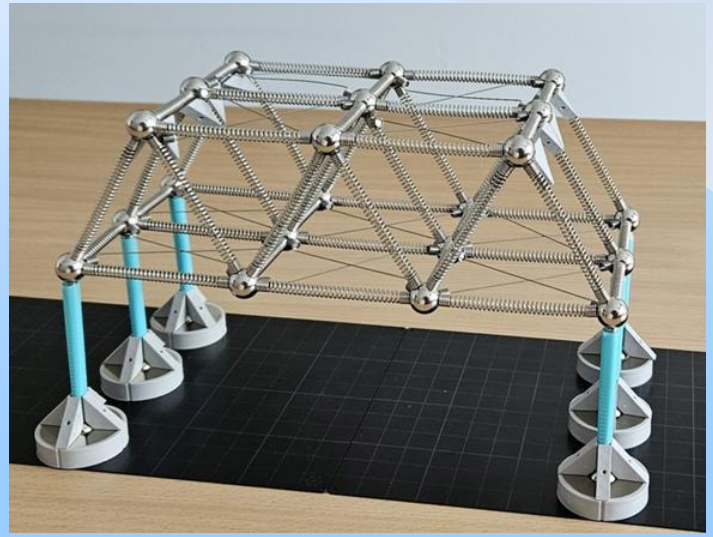

Stability analysis of a complex structure in various configurations

It's possible to demonstrate, among other things, how the **Kinematic Method** for determining **Influence Lines** works

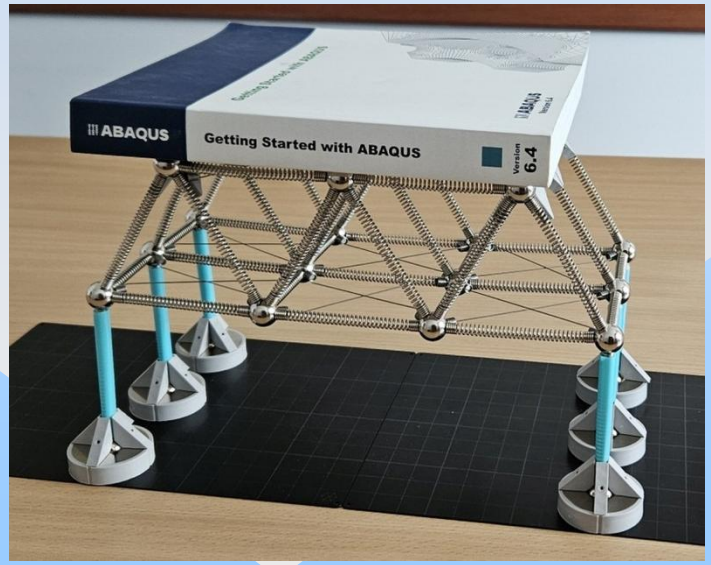


Oh, not many students like doing these calculations ...





Conclusion: *Mola Structural Kits can be used to teach many topics in Structural Mechanics, covering statics, stability, and even dynamics.*



A few final reflections

- By introducing interesting teaching aids, we gain student engagement and better concentration during classes.
- Students better develop and absorb knowledge when they can 'touch the solutions' and when they can independently test their ideas on real models (often learning from mistakes).
- Working in groups, they develop their engineering skills as well as 'soft skills' (collaboration, communication, problem-solving, etc.).
- *Mola Structural Kit* sets offer interesting opportunities for working with students (as an additional activity) and can be used in various courses related to *Structural Mechanics* (*Mechanics, Strength of Materials, Structural Mechanics*, etc.), in degree programs such as: *Civil Engineering*, *Architecture*, *Mechanical Engineering*.

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Thank you for your attention

- Mariusz Ruchwa

Cracow, Poland, 18-19.09.2025

http://www.kmb.tu.koszalin.pl/ruchwa