



WARSAW UNIVERSITY OF TECHNOLOGY

THE FACULTY OF POWER AND AERONAUTICAL ENGINEERING

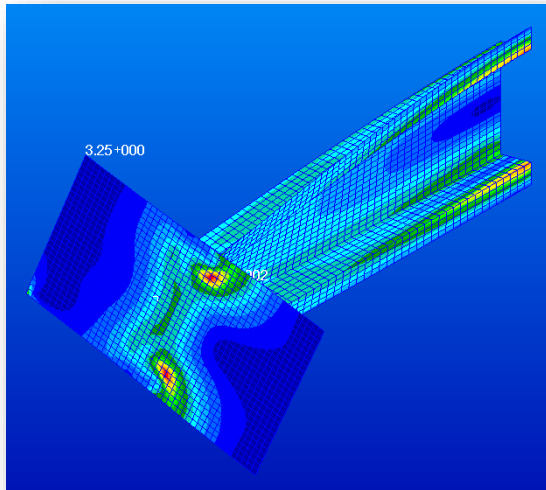
Division of Strength of Structures and Materials



Introductory classes

Summer semester 2023/2024 a.k.a. 2024L

„Mechanics of Thin-Walled Structures (MTS)”



Supervisor/lectures: Prof. Adam Dacko, Ph.D., D.Sc.

Tutorials/exercises: Katarzyna Gojny, Ph.D.

Warszawa, 20.02.2024



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Division of Strength of Structures and Materials



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Warszawa, 20.02.2024



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Division of Strength of Structures and Materials



1. Contact

Supervisor:

Prof. Adam Dacko, Ph.D., D.Sc.

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Assistant:

Katarzyna Gojny, Ph.D.

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Warszawa, 20.02.2024



2. Website of Division of Strength of Materials and Structures

Please write this link down:

<https://www.meil.pw.edu.pl/zwmik/ZWMiK/Dla-studentow2/MTS>
(or use **TEAMS** “pliki=files” tab)

Website mainly contains:

- updated information
- regulations
- homeworks
- lab manuals
- other

All guidelines from
this presentation
are on this website
and on **TEAMS**.



Website:

<https://www.meil.pw.edu.pl/zwmik/ZWMIK/Dla-studentow2/MTS>



Badania

Pracownicy

Dydaktyka

Dla studentów

Konsultacje semestr zimowy 2023/24



Zakład Wytrzymałości Materiałów i Konstrukcji

Wydział Mechaniczny Energetyki i Lotnictwa



Mechanics of Thin-Walled Structures

Dla studentów

Dla studentów - strona startowa

Updated information:

NEWS on the FE software used in MTS class - computer lab:

1. Here goes the link to the current "Patran-Nastran" student version:

<https://www.mscsoftware.com/student-editions>

2. The above link is for number of CAE programs - **for this course** MSC Nastran with Patran is of interest

From the MSC web-page you can download **also** the "Documentation-installation" file, as well as the "Examples_installation" file.

3. Registration at MSC site for student versions is necessary (scan/photo of Student ID card is required)



3. Lecture topics

0. Contents & requirements

1. Knowledge refreshment:

Stress, Strain, Moment of inertia (first, second, inclined section), Bending, Torsion

2. Thin-walled structures introduction

3. Beams (1D structures):

- bending of beams

- shear center definition

4. Bending of open section beams

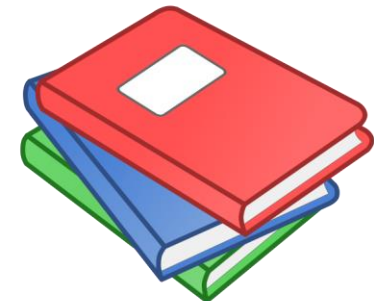
5. Bending of closed section beams

6. Torsion of beams

- Free torsion

- Constrained torsion

7. Buckling

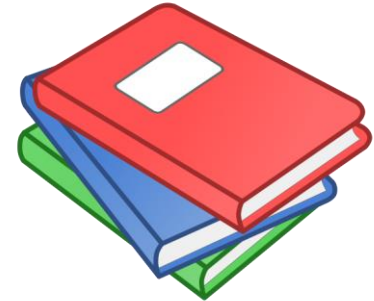




4. Literature

Recommended book:

- 1) **"An Introduction to Aircraft Structural Analysis"**, T.H.G. Megson,
Published by Elsevier Ltd., 2010

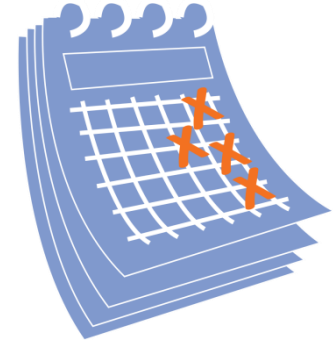


Polish books:

- 1) **„Statyka i stateczność konstrukcji prętowych i cienkościennych"**, Zbigniew Brzoska,
Państwowe Wydawnictwo Naukowe, Warszawa 1961
- 2) **„Mechanika Materiałów i Konstrukcji"**, tom 1 i 2, Marek Bijak-Żochowski i inni,
Oficyna Wydawnicza Politechniki Warszawskiej
- 3) **„Wytrzymałość Materiałów"**, Zbigniew Brzoska,
Państwowe Wydawnictwo Naukowe, Warszawa 1974



5. Important dates



Lectures & Exercises 8:15 – 12:00 (4 h):

20.02 Lecture 1

27.02 Lecture 2

05.03 **Exercise 1**

12.03 Lecture 3

19.03 **Test 1**, **Exercise 2**

26.03 Lecture 4

02.04 **DAY OFF – Eastern Holidays**

09.04 **Test 2**, Lab introduction (MSC Patran+Nastran)

Please don't be late!
All tests will start at 8:15.
Lectures will also start at 8:15.



5. Important dates

Laboratories 8:15 – 12:00 (4 h):

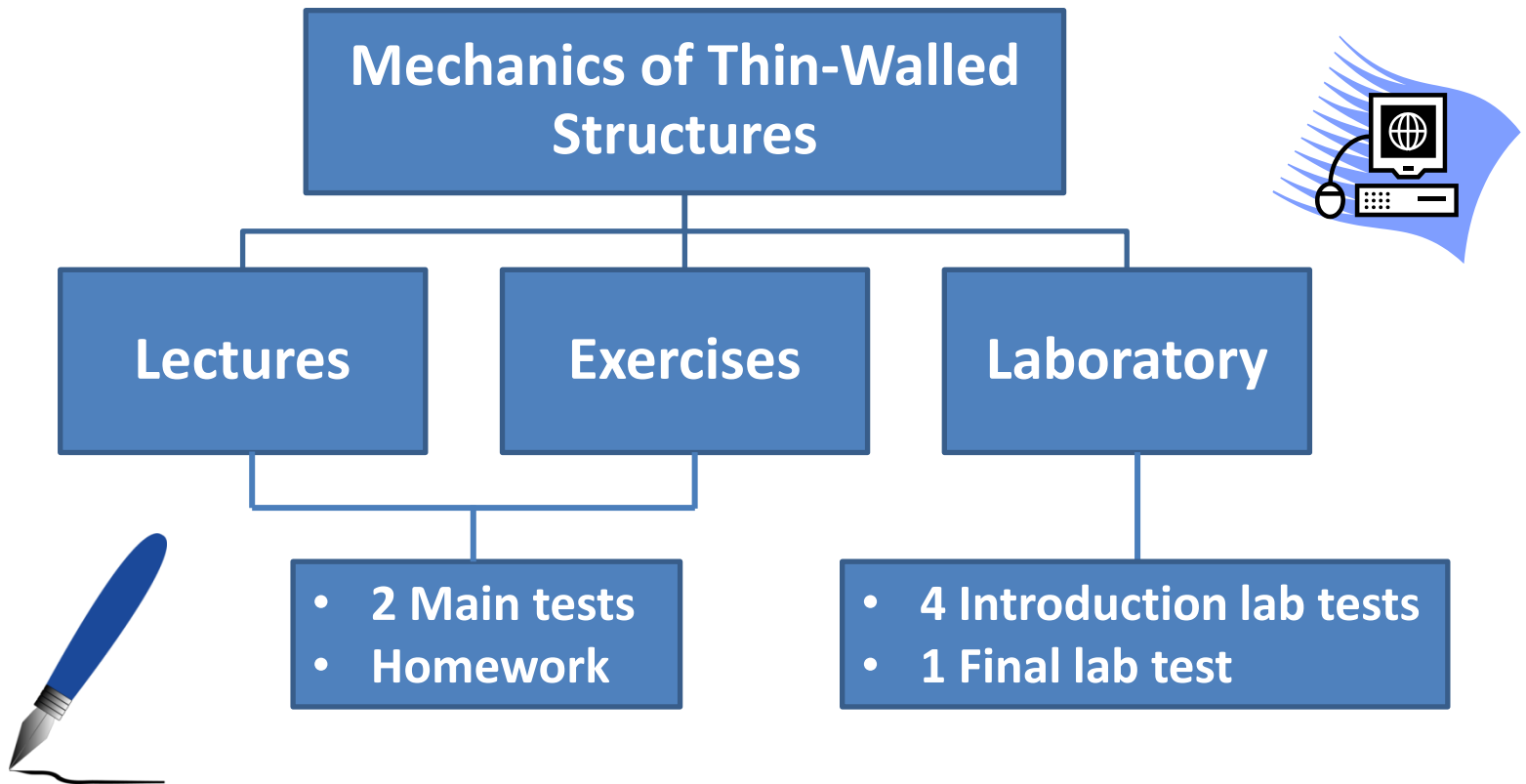
16.04	Lab 1 (group 1):	8:15 – 12:00 (4 h)	Clevis
23.04	Lab 2 (group 1):	8:15 – 12:00 (4 h)	Conical Structure
30.04	DAY OFF		
07.05	Lab 3 (group 1):	8:15 – 12:00 (4 h)	Thin-walled beam
14.05	Lab 4 (group 1):	8:15 – 12:00 (4 h)	Buckling & Final lab test
21.05	Lab 1 (group 2):	8:15 – 12:00 (4 h)	Clevis
28.05	Lab 2 (group 2):	8:15 – 12:00 (4 h)	Conical Structure
04.06	Lab 3 (group 2):	8:15 – 12:00 (4 h)	Thin-walled beam
11.06	Lab 4 (group 2):	8:15 – 12:00 (4 h)	Buckling & Final lab test



Please don't be late!
Laboratories will start at 8:15.



6. Regulations





6. Regulations

The “Mechanics of Thin-Walled Structures” course consists of the following parts:

- a) **lectures and exercises part** – includes 2 main tests & short tests
- b) **laboratory part** – includes 4 introduction lab tests & 1 final lab test



6. Regulations -> LECTURE & EXERCISES

1. Attendance on **lectures** is not obligatory, but it is **highly recommended**.
2. Attendance on **exercises** is **obligatory**.
3. There are **2 main tests** and **each test** must be passed at **minimum grade 3.0**.
4. There is **one homework** that must be submitted on time.



6. Regulations -> LABORATORY

1. Attendance is **obligatory**.
2. There are 4 meetings.
3. Outerwear must be left in the cloakroom.
4. Eating and drinking are not allowed in the laboratory rooms.
5. Lab classes take place in room 20B (to the left of the front-desk to the Institute) or room 129 (in front of the Dean's office).





6. Regulations -> LABORATORY



6. There are **4 introduction lab tests** and each one of them must be passed at **minimum grade 3.0**.

7. **Participation** in lab classes is allowed based on the passed introduction lab test (**min. grade 3.0**).

8. There is **1 final lab test** which must be passed at **minimum grade 3.0**.

9. Topics of the laboratory: Clevis, Conical Structure, Thin-walled beam, Buckling.

10. **Each lab exercise** must be **passed** based on the **results** obtained by a student (plots, graphs, etc.).



6. Regulations -> GRADES



Final grade from the course =

$$= 0,25 * T1 + 0,25 * T2 + 0,15 * HMW + 0,15 * Intro_Lab_T + 0,2 * Final_Lab_T$$

T1 – grade from main test no. 1

T2 – grade from main test no. 2

HMW – final grade from homework

Intro_Lab_T – final grade from introduction lab tests (average grade based on all 4 intro lab tests)

Final_Lab_T – final grade from final lab test

The calculated average from the above formula for “final grade from the course” must be equal to **minimum 3.0** in order to pass the course.



6. Regulations -> Improvement tests

1. The main tests and final lab test can be improved.
2. There are no improvements of introduction lab tests.

If you fail (or miss) the test, you MUST attend the Improvement Test to have a chance to pass the MTS course.





6. Regulations -> ATTENTION

Absence on **each** of the above-mentioned **test** results in the grade **0.0**.



E.g. in case of illness, please send us the information (via e-mail) earlier about your indisposition.



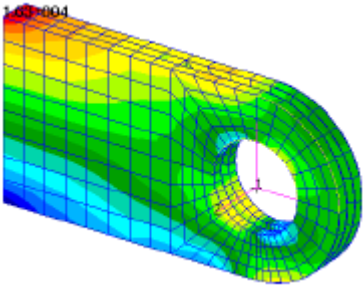
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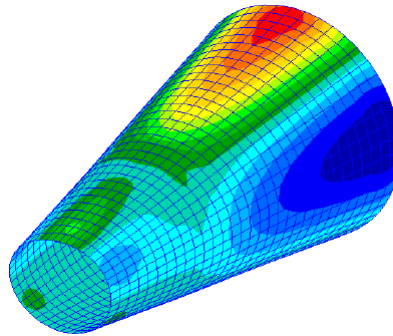
Division of Strength of Structures and Materials



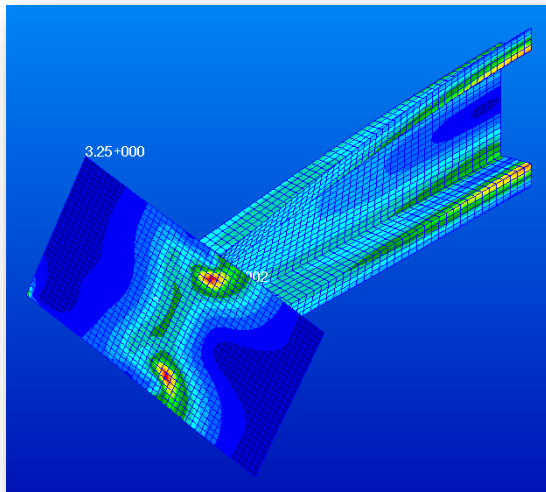
Topics of the laboratory:



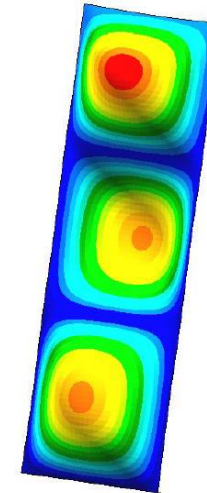
1. Clevis



2. Conical Structure



3. Thin-walled beam



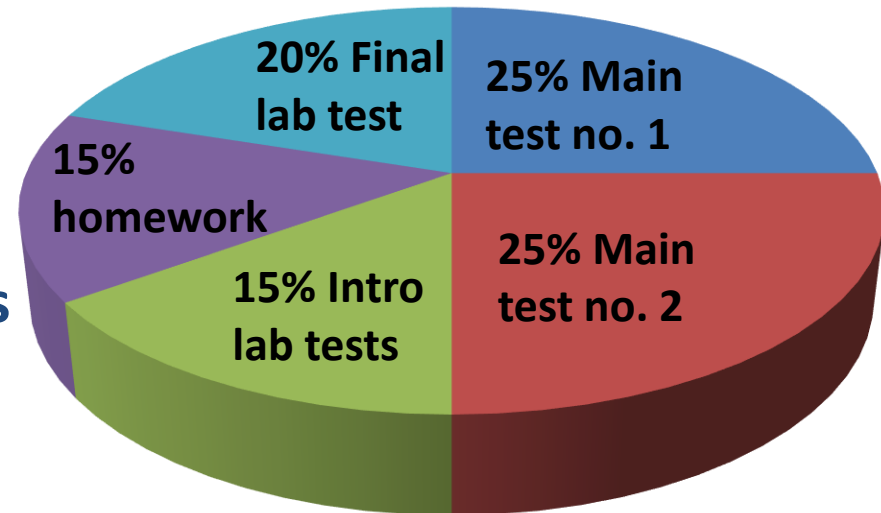
4. Buckling



7. Summary



- 2 main tests
- 1 homework
- 4 laboratories = 4 intro lab tests
- 1 final lab test



Each test must be passed at **minimum grade 3.0**.

Final grade from the course =

$$= 0,25 * T1 + 0,25 * T2 + 0,15 * HMW + 0,15 * Intro_Lab_T + 0,2 * Final_Lab_T = \text{min. } 3.0$$

in order to **pass the course**



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Questions





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Thank you for your attention!