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1. **FEM I** (2L+1L)
2. Lectures (15x2 h)
3. Computer laboratory (15 h)
4. Consultations via MS Teams
5. There are 2 tests scheduled per semester (graded on a scale of 0 to 5)
6. Passing the lecture – passing each test with a grade of at least 3- (2.75) is required.
7. Passing the laboratory – according to the rules agreed with the lab instructor.
8. Passing the course – passing both parts (lecture and lab) is required

Final grade= (grade from test 1 + grade from test 2 + grade from the laboratory)/3.

Class schedule:

1. Theorem of minimum total potential energy. Ritz method in structural mechanics. Approximate methods in the analysis of continuum media. Introduction to FEM. Discretization and approximation.
2. The boundary value problem of solid mechanics in the FEM approach. General principles of constructing equations for static stress analysis.
3. Two-dimensional problems of the theory of elasticity. CST triangular element, 8-node quadrilateral element, 4-node quadrilateral element.
4. Numerical integration

TEST 1

5. Analysis of bar structures. Stiffness matrices for tension bars, bending beams, trusses and frames.
6. 3D shell element.
7. Flow chart of a typical FEM program. Problems with the accuracy of analyses.

TEST 2

***Laboratory**: Introduction to the use of the ANSYS system.*
Building and analyzing simple structural models:

- *two-dimensional (e.g. determining the stress concentration coefficient in the notches)*
- *three-dimensional (e.g. thick-walled pipe connections, shell structures).*

(Comparison of numerical solutions with literature results).

FINITE ELEMENT METHOD 1 – LITERATURE

- Bijak-Żochowski M., Jaworski A., Krzesiński G., Zagrajek T.: Mechanika Materiałów i Konstrukcji, Tom 2, Warszawa, Oficyna Wydawnicza, PW, 2005
- Bathe, K. J.: Finite Element Procedures. 2nd ed. Prentice Hall Inc. , 2014.
- Chen X., Liu Y.: Finite Element Modeling and simulation with ANSYS Workbench, CRC Press 2015
- Moaveni S.: Finite element analysis: theory and application with ANSYS 4th ed., Boston : Pearson&cop. 2015.
- Baskharone E. A.: The finite element method with heat transfer and fluid mechanics applications
- Zienkiewicz O.C., Taylor R.L.: The Finite Element Method, 5th ed., Butterworth-Heinemann, 2000, Vol.1-3.
- Al-Khafaji A.W., Tooley J.R.: Numerical methods in engineering practice, Holt, Rinehart & Winston, 1986.
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- Bathe K.J.: Finite element procedures in engineering practice, Prentice-Hall, 1981
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- Gallagher R.H.: Finite element analysis: Fundamentals, Prentice-Hall, 1975
- Hinton E., Owen D.R.C.: An introduction to finite element computations, Pineridge, 1979
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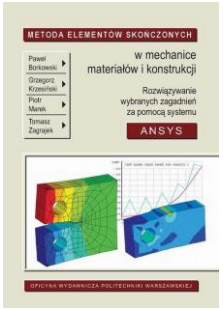

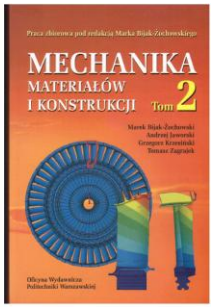

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Artykuł

Research | People | Teaching | For students | Consultations winter semester 2024/25

Division of Strength of Materials and Structures

Faculty of Power and Aeronautical Engineering

Handouts and information for students

Finite Element Method 1	lecture
Finite Element Method 2	lecture
Integrated Laboratory	link
Mechanics of Thin-Walled Structures	link
Structural Analysis of Aeroengines	link

For students

For students - strona startowa