General Information:

Name of Course: # MATHEMATICAL FOUNDATIONS OF FINITE ELEMENT METHOD

Course Code: PM-TSTNM0590A
Semester: 2nd
Number of Credits: 2
Allotment of Hours per Week: 2 lecture/Week
Evaluation: signature (with grade)
Prerequisites: **none**

Instructors: **Dr Vanda Olimpia Pomezanski, associate professor**
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Introduction, Learning Outcomes:
This course is aimed to provide basic and advanced knowledge on the Finite Element Modelling. Topics covered by the course include: Theoretical ground and application of Galerkin and Ritz methods, basic steps of the general finite element analysis, geometrical and mathematical finitization, calculation of elementary stiffness matrices, compilation technics, estimation of numerical errors, locking problems, the question of stability and convergence.

Methodology:
- **Lectures**: will give an introduction of theoretical background of Finite Element Modelling.
- **Examples**: will present the connection between the theory and practice.
- **AXIS Program usage**: will present the possibilities of applications.

Schedule:

Week 1: Course description
Week 2: Introduction, Truss structures
Week 3: Equilibrium and compatibility equations, Linear Algebra calculations, Truss structures
Week 4: Numerical calculations, errors
Week 5: Theoretical ground and application of Galerkin and Ritz methods, Frame structures
Week 6: Geometrical finitizations, coordinate systems, coordinate transformations, Frame structures
Week 7: Geometrical and mathematical finitization, shape functions of an element
Week 8: Elementary and structural stiffness matrixes
Week 9: Supports
Week 10: Frames with Trusses
Week 11: *Spring Break – no classes*
Week 12: Frames with Trusses
Week 13: Plates and shells
Week 14: Compilation technics, estimation of numerical errors
Week 15: ***Exam***

Attendance:
Attending is required all classes, and will impact the grade (max. 10%). Unexcused absences will adversely affect the grade, and in case of absence from more than 30% of the total number of lesson will be grounds for failing the class. To be in class at the beginning time and stay until the scheduled end of the lesson is required, tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency, the student must present a valid excuse, such as a doctor's note.

Evaluation + Grading

10% - Attendance
90% - Exam.

Grading Scale:

Numeric Grade:	5	4	3	2	1
	excellent	good	satisfactory	pass	fail
Evaluation in points:	91%-100%	80%-90%	61%-80%	51%-60%	0-50%

PTE Grading Policy:
Information on PTE's grading policy can be found at the following location:

Students with Special Needs:
Students with a disability and needs to request special accommodations, please, notify the Deans Office. Proper documentation of disability will be required. All attempts to provide an equal learning environment for all will be made.

Readings and Reference Materials:

- Krishnamoorty, C. S.: Finite Element Analysis, Tata McGraw-Hill, NewDelhi, 1994.
- Zienkiewicz, O. C.: The Finite Element Method in Engineering Science, McGraw-Hill, London, 1971.
- Fish, J. – Belytschko, T.: First Course in Finite Elements, Wiley, 2008.
- Akin, J. E.: Finite Elements for Analysis and Design, Academic Press, 1995.
- Zienkiewicz, O. C. – Taylor, R. L.: The Finite Element Method: The Basis + Solid Mechanics, Butterworth, 2000.
- Belytschko, T. – Liu, W. K. – Mora, B.: Nonlinear Finite Elements for Continua and Structures, Wiley, 2000
- Wriggers, P.: Nonlinear Finite Element Methods: Springer, 2008