Óbuda University Bánki Faculty of Mechanical and Safety Engineering	Institute of Materials and Manufacturing Science

Subject title and code: Finite element modeling of materials technologies (Anyagtechnológiák végeselemes modellezése) BAKTNAMBNE
Credits: 2
Full time course, 2017/2018/II

Available for: Mechanical engineering BSC, CAD/CAM specialization
Mechatronics MSc (English)

Responsible:	dr. Gonda Viktor	Instructor:	dr. Gonda Viktor
Prerequisite	-		

Weekly classes:	Lecture: 0	Seminar: 0	Laboratory: 2	Consultation: upon request
Evaluation (s,v,f): f	Continuous			

Curriculum

Aim of the course: In the analysis of materials technologies, finite element modeling is beneficial for the determination of stress, strain and temperature distributions, and other technological parameters for complex geometries. By using the MARC finite element software, mechanical, thermal, coupled thermo-mechanical sample problems will be solved. After finishing the course, the student will be able to define a simplified mechanical and/or thermal model for forming or heat treatment, implement it in finite element, run the model, and post process the results, serving as an initial step for further optimizing a solution for more complex problems.

Content of the course: The MARC work environment. Solving an elastic problem. Setting up plasticity: yield condition, and material model. Modeling upsetting and extrusion. Solutions for sheet metal forming problems. Thermal model and boundary conditions. Construction of a coupled thermo-mechanical problem. Mesh refinement, and automatic re-mesh. Importing a CAD geometry. Automatic parameter analysis with macros.

1. Schedule

Acad. week	Topic
1.	Setting up the environment. Elastic problem I: pre-processing
2.	Elastic problem II: submission, post-processing
3.	Plastic problem: properties for plasticity, submission, post-processing.
4.	Assignments.
5.	Solving upsetting I: definition of axisymmetric geometry, mechanical properties, submission, post-processing.
6.	Tube flaring. Extrusion base example.
7.	Thermal base examples: modeling conduction and convection.
8.	Solving upsetting II: remesh, assignment of thermal properties, submission of coupled problem, post-processing.
9.	Generalized press forming problem, import from CAD.
10.	Solving deep drawing, examining formability.
11.	Definition of parametric problems. Automatic submission and pre-processing.
12.	Assignment report deadline.
13.	Consultation.
14.	Retake.

2. References

1. Marc User's Guide, MSC Software, 2017.
2. MARC Vol. A-E, MSC Software, 2017.
3. Henry S. Valberg: Applied metal forming, Cambridge University Press, 2010.

3. Requirements

a) Presence:
compulsory.

b) Tests

Academic week	task
12.	assignment report deadline

c) Conditions for signature
Absence less than 30%.
Accepted assignment.

d) Final mark
Based on the report.

e) Supplement for absence
If justified, supplement with written test .

f) Examination
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g) Pre-examination
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h) Retake in exam period
Resubmission of the report until the end of the second examination week.

Budapest, 2018. February 12. Dr. Gonda Viktor, associate professor