

Tárgytematika / Course Description

Mathematical Models and Methods

GKNM_MSTA004**Tárgyfelelős neve /****Teacher's name:** dr. Bácsi Ádám**Félév / Semester:** 2025/26/1**Beszámolási forma /****Assesment:** Vizsga**Tárgy heti óraszám /****Teaching hours(week):** 2/2/0**Tárgy féléves óraszám /****Teaching hours(sem.):** 0/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

In the course, complex engineering problems will be modelled and solved using mathematical methods. As a first step, the engineering problem is split into subtasks and the solution strategy is defined. Next, the necessary mathematical tools are presented which are practiced through easier examples. Finally, the complex problem is solved and numerically implemented (e.g. In Excel or MatLAB).

TANTÁRGY TARTALMA / DESCRIPTION

Week 1-2: Plot of functions with logarithmic scales. Parametric functions and equations.

Week 3-4: Differential equations - first and second order, linear, homogeneous. Applications.

Week 5-6: Non-linear differential equations. Linearization and applications. Equilibrium of non-linear systems. Stability.

Week 7-8: Differential equation systems - first and second order linear systems. Stability of equilibrium in non-linear systems.

Week 9: Inhomogeneous differential equations. Laplace transformation. Applications.

Week 10-11: Properties of curves in two- and three dimensions. Polar coordinates. Parametrization of curves.

Week 12: Properties of surfaces. Area of surfaces.

Week 13: Volume of three-dimensional curved objects.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESSMENT'S METHOD

In order to get a signature for the course, one mid-term test must be written on the 9th week and reach at least 50% of the total points.

In the exam period, a written exam must be accomplished.

Evaluation of the exam:

88% - 100 % excellent (5)

75 % - 87 % good (4)

63 % - 74 % satisfactory (3)

50 % - 62 % pass (2)

0 % - 49 % fail (1)

The total number of points in the exam is 60. The students can gain an extra 10 points to the exam points by providing a presentation on the 14th week. The presentation topics will be announced at the lecture.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

All necessary notes and literature are uploaded to the SzeLearning page of the course.

AJÁNLOTT IRODALOM / RECOMMENDED MATERIAL