The Technical University of Košice, Faculty of Mechanical Engineering

Course unit title:	**NUMERICAL METHODS**
Study programme:	**Automotive Production** **Mechanical Engineering**
Study period:	**2st year, WT 2019/2020**
Faculty:	**Faculty of Mechanical Engineering**
Level of study:	**Bachelor**
Form of study:	**Full time**
Evaluation:	**Graded credit test**
Number of credits:	**2**
Guaranteeing department:	**DEPARTMENT OF APPLIED MATHEMATICS AND INFORMATICS**
Guarantor:	**prof. RNDr. Martin BAČA, CSc.**

Week	**Lectures** **Number of hours: 2 per week**	**Tutorials** **Number of hours: 2 per week**
1.	Introduction to numerical methods.	Introduction to numerical methods.
2.	Approximate solutions of algebraic and transcendental equations. Graphical solution of equation $f(x) = 0$. The halving method.	Graphical solution of equation $f(x) = 0$. The halving method.
3.	Numerical methods of approximate solution of equation $f(x) = 0$. Method of chords. Newton's method. The method of iteration.	Method of chords. Newton's method. The method of iteration.
4.	Solving systems of linear equations. The method of iteration. The Seidel method.	Solving systems of linear equations. The method of iteration. The Seidel method.
5.	The interpolation of functions.	Lagrange's interpolation formula. Lagrangian coefficients. Newton's interpolation formula. Inverse interpolation.
6.	Approximation of functions. The least squares method. Linear approximation.	Approximation of functions. The least squares method. Linear approximation.
7.	The least squares method. Non-linear approximations.	*Test.*
8.	Approximate integration of functions. The trapezoidal formula and its remainder term.	The least squares method. Non-linear approximations.
9.	Simpson's formula and its remainder term.	The trapezoidal formula.
10.	Approximate integration of functions. Richardson extrapolation.	Simpson's formula. Richardson extrapolation.
11.	Solving differential equations based on methods of numerical approximations. Euler's method for the first order differential equation.	Numerical methods for approximating the solution to differential equations. Euler's method.
12.	The fourth order Runge-Kutta method to solve differential equations.	The fourth order Runge-Kutta method to solve differential equations.
13.	Numerical methods to solve systems of differential equations. Runge-Kutta method for systems of differential equations.	*Test.*

Recommended reading:

1. Chapra, S., Canale, R.: Numerical methods for engineers, McGraw-Hill, 2010.
2. Yang, X.S.: Introduction to computational mathematics. World Scientific, 2008.
3. Strang, G.: Computational science and engineering. Wiley, 2007.
4. Pav, S.E.: Numerical methods course notes, University of California at San Diego, 2005.
5. Hämmerlin, G., Hoffmann, K.H.: Numerical mathematics, Springer-Verlag, New York, 1991.

Evaluation:

EVALUATION

1st test:	**40 points**
2nd test:	**40 points**
Homework assignments:	**20 points**
Graded credit test:	**total points 100, required minimum 51**

The necessary condition for obtaining a course credit is to write down homework assignments.

Attendance of lectures and classes is compulsory.

Košice, 20th September, 2019

Signature of guarantee

You can find these information on webpage
http://www.sjf.tuke.sk/kamai/students/syllabi