Course Unit Descriptor

Study Programme: *PRECISION AGRICULTURE*

Course Unit Title: Differential equations of motion and their software solution

Course Unit Code: 19.PRP031

Name of Lecturer(s): Full professor Dragi Radomirović, Associate professor Nebojša Dedović

Type and Level of Studies: Master academic studies

Course Status (compulsory/elective): elective

Semester (winter/summer): winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 5

Prerequisites: -

Course Aims:

The aim of the course would be for the student to learn to form differential equations of motion of mechanical systems as well as to find them analytically or numerically with the help of appropriate software for given initial conditions of the solution.

Learning Outcomes:

Students will be able to form differential equations of motion of mechanical systems as well as to find them analytically or numerically with the help of appropriate software for given initial conditions of the solution.

Syllabus:

Theory

Basic concepts of mechanics required for the formation of differential equations of motion of mechanical systems, generalized coordinates and generalized velocities, auxiliary coordinates and connections between auxiliary and generalized coordinate, kinetic energy of a mechanical system as a function of Lagrangian variables, virtual work of forces and couplings acting on the mechanical system and generalized forces, potential energy of mechanical system on the basis of which generalized forces of conservative actions can be obtained, dissipative function mechanical system on the basis of which generalized forces of some non-conservative actions can be obtained, the virtual work of those forces and couplings that are not incorporated into the potential energy and dissipative function and to it appropriate generalized forces, formation of differential equations of motion of mechanical systems using Lagrangian equations of the second kind, using software to solve the formed equations movements and given initial conditions (initial problem).

Practice

Solving the problems rose from the theory.

Required Reading:

1. Abell, M.L., Braselton, J.P., Differential Equations with Mathematica, 3rd edition, Elsevier Inc. 2004.
2. Holmes, M.H., Introduction to Numerical Methods in Differential Equations, Springer-Verlag, New York, 2007.
3. Lurie, A. I., Analytical Mechanics, Springer-Verlag Berlin, Heidelberg, 2002.
4. Kolovsky, M. Z., Evgrafov, A. N., Semenov, Y.A., Slousch, A.V., Advanced Theory of Mechanisms and Machines, Springer-Verlag, Berlin, Heidelberg, 2000.
5. Wolfram, S., Mathematica, a System for Doing Mathematics by Computer (2nd edition), Addison-Wesley Publishing Company, Inc., 1991.
6. Gilat, A., MATLAB An Introduction with Applications (3ed edition), John Wiley & Sons, Inc., 2008.

Weekly Contact Hours:	**Lectures:** 2	**Practical work:** 2

Teaching Methods:

Theory and practical classes, consultations if needed.

Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation	10	written exam	
Practical work		oral exam	50
Preliminary exam(s)		…….	
Seminar(s)	40		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			