The aim of the project is to develop a method allowing to analyze the stability and load capacity of thin-walled plate constructions subjected to variable loads over time. The method will be developed and tested for the simplest components, such as thin plates. The analysis will cover isotropic, orthotropic and composite plates (laminates) in the context of the assessment of their response to variable load over time (dynamic response). In the proposed method, the evaluations implemented and adapted to the deformation analysis of deformable bodies will be tools used mainly in the theory of dynamic systems vibrations (e.g. in the theory of bifurcation and chaos). The damping effect and its influence on the dynamic response of the study structure will be analyzed. The proposed method a two-parameter function of deflection will take into account. Numerical investigations for the loads of moderately large amplitude and durations from the time of equal periods of fundamental vibrations of the plate to the times many times greater than the period of fundamental vibrations of the structures will be made.

The work plan assumes for the implementation of the project the following specific objectives:

1. Dynamic analysis for isotropic, orthotropic and composite plates (laminates) without damping effect and two-parameter function of deflection.
2. Determination the impact of damping effect on the nature of dynamic response for isotropic, ortotropic and composite plates.
3. Determination the impact of two-parameter function of deflection on the nature of dynamic response and improving the accuracy of the solution in a postbuckling range for isotropic, ortotropic and composite plates.

All numerical analysis will be conducted by applying tools that are mainly used in the vibrations theory of dynamical systems such as: phase portraits, Poincaré maps, Lyapunov exponents, FFT analysis.

The authors decided to develop a new method using tools mainly used in vibration theory of mechanical systems in order to analyze the structures that have been mostly studied by using criteria that were based on the analysis of deflection of the structure [1-3] or the analysis of stress state [4]. It should also be noted that in most dynamic stability works, the damping effect and the two-parameter function of deflection were not taken into account (e.g. [5-8]).

Therefore, a significant result of the research will be the determination the impact of damping effect and two-parameter function of deflection on the nature of dynamic response and improving the accuracy of the solution in a postbuckling range for isotropic, ortotropic and composite plates.

The successful implementation of the project objective will provide a valuable contribution to the study of dynamic stability (dynamic response) of plate structures by using unpopular dynamic method. The results significantly expand the knowledge in the field of dynamic stability of the test structures by applying tools such as: phase portraits, Poincaré maps, Lyapunov exponents, FFT analysis. Using above tools allow not only estimate the stability (or lack thereof) of analyzed structures but also present the nature of solution. In addition, it should be noted that the applicants undertake scientific issue of interdisciplinary nature.

The results of this work will have a universal character, because the dynamics of nonlinear systems and transition from stationary to quasi-periodic or chaotic solutions relate to various fields of science.

[1] Hutchinson, J. W., & Budiansky, B. (1966). Dynamic buckling estimates. *AIAA Journal*, *4*(3), 525-530.
[2] Budiansky, B., & Roth, R. S. (1962). Axisymmetric dynamic buckling of clamped shallow spherical shells. *1962.*, 597-606.
[3] Volmir, A. S. (1972). Nonlinear Dynamics Plates and Shells (Moscow, Science).
[4] Petry, D., & Fahlbusch, G. (2000). Dynamic buckling of thin isotropic plates subjected to in-plane impact. *Thin-Walled Structures*, *38*(3), 267-283.
[5] Kolakowski, Z., & Kubiak, T. (2007). Interactive dynamic buckling of orthotropic thin-walled channels subjected to in-plane pulse loading. *Composite structures*, *81*(2), 222-232.
[6] Shariyat, M. (2009). Dynamic buckling of imperfect laminated plates with piezoelectric sensors and actuators subjected to thermo-electro-mechanical loadings, considering the temperature-dependency of the material properties. *Composite Structures*, *88*(2), 228-239.
[7] Weller, T., Abramovich, H., & Yaffe, R. (1989). Dynamic buckling of beams and plates subjected to axial impact. *Computers & Structures*, *32*(3-4), 835-851
[8] Kowal-Michalska, K. (2010). About some important parameters in dynamic buckling analysis of plated structures subjected to pulse loading. *Mechanics and Mechanical Engineering*, *14*(2), 269-279.