**Mathematical biology**

**Course program**

**1. Introduction (mathematical modelling)**

Cognition and modeling. Science and mathematics. Equation of falling body. Principles of constructing a mathematical model. Classification of mathematical models. Characteristics of mathematical models. Example (probe flight).

Task. *Characteristics of a mathematical model using examples of missile and glider flight problems*.

**2. Differentiation and Malthus model**

Three interpretations of the concept of derivative. Simplest properties of a derivative. Differentiation and integration. Evolution of a biological species and the Malthus model. Analysis of the Malthus model.

Task. *Derivative properties and Malthus model*.

**3. Differential equations and the Verhulst model**

Differential equations. Equilibrium position of dynamic systems. Stability of the equilibrium position. Evolution of a biological species with limited food supply. Verhulst model and his qualitative analysis.

Task. *Equilibrium positions of dynamic systems and Verhulst* *model.*

**4. Systems of differential equations and the “predator-prey” model**

Systems of differential equations. Phase plane. Equilibrium positions of the system. The predator-prey model and its qualitative analysis.

Task. *Predator-prey model.*

**5. Symbiosis model**

Model of symbiosis and its qualitative analysis. Variants of system behavior.

Task.*Symbiosis model.*

**6. Biological competition model**

Competition model and its qualitative analysis. Variants of system behavior.

Task. *Competition model.*

**7. Biological niche model**

Niche model and its qualitative analysis. Variants of system behavior.

Task. *Niche model.*

**8. Economic interpretation of biological models**

Economic analogues of the Malthus, Verhulst, predator-prey, symbiosis, competition and niche models.

Task. *Biological-Economic Dictionary*