

New Energy and Resource-saving Processes in a Circular Economy

Course Workload		Assessment form (examination/ graded test/ ungraded test)
ECTS	Hours	
3	108	Exam

The aim of the discipline is to prepare students in the field of rational use of material and energy resources in chemical technology, petrochemistry and biotechnology. This course presents the basic concepts of the theory of resource savings and resource-saving technologies. Additionally, the course covers: -methods and means of energy supply systems, energy consumption; -energy saving and efficient use of energy resources, generation of energy; -methods of thermodynamic (those including exergetic), analysis of energy efficiency of energy generation;-the trends and prospects of development of modern resource-saving systems in chemical technology, petrochemistry and biotechnology. The discipline develops an understanding of the theory of energy- and resource-saving and resource-saving technologies in relation to food biotechnological technologies and industries within the concept of closed-loop economy.

Course structure:

1. Introduction of modern energy- and resource-saving processes in food and biotechnology productions

1.1. Production flowchart and basic processes of food and biotechnology production technology

1.2. Types of energy consumed, energy sources

1.3. The composition of the energy system of productions

1.4. By-products or secondary energy resources, and integration of energy technology processes into production

2. Methods of thermodynamic, exergetic analysis of energy-chemical and technological systems of food and biotechnological productions

2.1. Thermodynamic methods of studying energy-chemical-technological systems (ECT systems or ECTS)

2.2. Types of energy and exergy. Calculation methods

2.3. The exergetic balances and characteristics of ECT systems

3. Thermodynamic (exergic) analysis of the perfection of energy- and resource-saving ECT processes of food and biotechnological productions

3.1. Assessment of thermodynamic perfection of energy- and resource-saving processes and technical systems

3.2. An exergic analysis and methods of improving the efficiency of heat generating systems

3.3. An exergic analysis and methods of improving the efficiency of heat generating systems

4. Fundamentals of ECT analysis and optimization

4.1. Structural analysis of ECT systems

4.2. The relationship between the indicators of perfection of single elements and the system as a whole

4.3. Exergic technical and economic optimization of ECT systems
