Abstract discipline «General Chemical Engineering»

1. Chemical Engineering as the science.

The role and meaning of chemical engineering in modern conditions of development of society. Areas in the development of chemical engineering. The main products of the chemical industry, the dynamics and the scale of their production. The technological concepts and definitions in chemical engineering.

2. Physicochemical laws of technological processes.

Thermodynamics of chemical-engineering processes. Influence of thermodynamic parameters on the depth of behavior of chemical-engineering processes. The calculation of the equilibrium composition of the mixtures. Kinetics of chemical-engineering processes. Kinetic equations. Influence of process parameters on the rate. Methods of intensification of homogeneous processes. The concept of optimal temperatures. The optimal temperature for reversible and irreversible exothermic and endothermic processes. The calculation of the equilibrium composition of the mixtures. Heterogeneous chemical processes, their classification. Heterogeneous processes in the system «gas-solid». The main stages of the heterogeneous process, behavior areas of heterogeneous process. Limiting stage and the methods of its detection. Methods of intensification of the heterogeneous processes in the system «gas-solid». Industrial Catalysis. Performance criteria of industrial catalysts. Heterogeneous catalysis: applications, industrial processes for preparing heterogeneous catalysts.

3. Chemical-engineering systems.

The structure of the chemical-engineering systems. Classification of the quantities characterizing the chemical-engineering system. Analysis and synthesis of the chemical-engineering systems. Homogeneous chemical-engineering systems.

4. Examples of technological solutions in the chemical industry.

Raw materials in the chemical industry, raw materials requirements, classification of mineral resources, mineral processing methods. The use of air and water in the chemical industry, industrial water treatment.

List of chemical productions under consideration:

- the technology of sulfuric acid;
- the synthesis of ammonia;
- technology of nitric acid;
- methanol technology;
- syntheses based on carbon monoxide and hydrogen;
- oil refining;
- natural gas processing;
- production of salt and fertilizer.

Case studies of technological design of industrial chemical processes include:

- characteristics of the product, raw materials for its production, field of use, scale and methods of production;
- physicochemical laws of process: stoichiometric, thermodynamic and kinetic;
- flowchart and its description, the main process parameters;
- instrumental solution of the basic unit;
- industrial emissions and ways of neutralization;
- the prospects for the technology development.

5. Prospects for General Chemical Engineering.

Modern tendencies in the development of the theory and practice of chemical engineering. New chemical-engineering processes. Promising sources of energy and raw materials for the chemical industry.