

**Topics for diploma exam  
master studies  
field of study: Chemical and Process Engineering  
Engineering of Technological Processes  
2016 / 2017**

1. Classification and hydrodynamics of multiphase flows.
2. Two-phase fluidization.
3. Formulation rules of momentum, mass and energy transport equations in single-phase systems.
4. Mixing: types, quality criteria of the process, examples of technical solutions.
5. Principles of pumps and fans selection.
6. Liquid-solid, liquid-liquid and liquid-gas dispersed systems; examples.
7. Formulation rules of momentum, mass and energy transport equations in multiphase systems.
8. Mass transport in dispersed systems.
9. Membrane processes – types, mechanism of mass transfer, industrial applications.
10. Unsteady heat conduction – mathematical modeling and design applications.
11. Designing of diaphragm heat exchanger.
12. Pseudohomogeneous models of catalytic fixed beds.
13. Graphical representation of the dynamics of distributed parameter systems.
14. Designing of extraction processes – types, thermodynamic basis and technological examples.
15. Adsorption equilibrium.
16. Adsorption in stirred tank and fixed bed column.
17. Modeling of catalytic process in a porous pellet – efficiency coefficient of pellet.
18. Catalytic reactors – principles of modeling and design.
19. Autothermal tubular reactors – occurrence, classification, design principles.
20. Dynamics analysis methods of objects in chemical engineering and technology.
21. Dynamics of chaotic systems.
22. Numerical optimization methods – classification and characteristics.
23. Optimization of serial systems with dynamic programming method.
24. Methods of determining extreme values of functions with inequality constraints.
25. Numerical integration methods for objects with distributed variables in chemical engineering.
26. Kinetics models of microbiological processes.
27. Design solutions of bioreactors for aerobic processes.
28. Continuous stirred tank bioreactors – modeling and design.
29. Mechanics and governing equations of heat transfer.
30. Mechanics and governing equations of mass transfer.