Differential vocational learning Food Process Design Specialization 2022 January

- 1. Open loop control (time-dependent, condition-dependent, following), pneumatic, electronic and mixed systems, applications.
- 2. Design of the Process Control systems. PLC-s: setup, functional elements, applications. Closed Loop Control with PLC.
- 3. Investigation of the automatic control systems; identification-analysis-synthesis. Experimental and differential equation-based description.
- 4. Time-domain to frequency-domain or operator-domain transformations; properties and rules of Fourier and Laplace transform. Transfer function.
- 5. Stability of the control systems, Nyquist and Bode diagrams. Signal conditioning with P, I, D members, tuning.
- 6. Actuators (electric, mechanic, pneumatic or hydraulic output), properties and applications
- 7. Error assessment, uncertainty propagation. Calculation of measurement errors of multicomponent systems. Present the method with an example.
- 8. Application of machine vision systems (VIS, NIR) in the food industry. Characterization of the color, shape and pattern properties. Multi- and hyperspectral systems. Evaluation methods.
- 9. Statistical assessment of the measurement results (regression analysis, variance analysis, classification). Multivariate methods for modeling and qualification.
- 10. Design of Experiments. OFAT (One Factor At a Time) and Factorial Designs construction, properties, application fields.
- 11. Steady-state process design (flow-sheeting, split-fraction concept, solving systems of linear and nonlinear equations) and modeling of process dynamics (initial value problems)
- 12. Classification and basic elements of optimization tasks. Formulation of mixed integer nonlinear optimization problem (MINLP) and linear programming (LP).
- 13. Significance and Economy of Membrane Filtration Processes.
- 14. Mass Transfer Membrane Processes, Theory, Modelling and Application of Pervaporation in Food Industry. Membrane Contactors.
- 15. Non-Steady State Heat Transfer in Solids and Liquids. Applied Dimensionless Criteria.
- 16. Principles of Absorption, Characteristics of Phase Equilibria, Gas Solubility, Two Film Theory, Design of Packed Column.
- 17. Batch and Continuous Distillation, Balance Equations and Operation Modes.
- 18. Batch and Continuous Rectification. Balance Equations and Operation Modes.
- 19. Advantages of Computer Modelling of Food Processing Technologies, Basic Principles and Tools of Design. The Characteristics of Super Pro Designer Software and Application Possibilities.
- 20. Novel food engineering unit operations