

Technologia Chemiczna

- Electric and magnetic field, charges and conductors in electric and magnetic fields, Maxwell's equations, electromagnetic waves
- The interaction of light with matter, physical optics, interference, diffraction, polarization.
- Special theory of relativity. Relativistic mechanics
- Quantum physics, quantum nature of radiation, wave properties of particles
- Periodic table of elements: structure of matter; chemical bonds; properties and application of elements and their compounds
- Physicochemistry of basic processes in aqueous solutions: reactions of acids and bases; precipitation / dissolution of sediments; complexation; oxidation and reduction
- Theoretical and practical aspects of chemical calculations: basics of stoichiometric calculations; ways of expressing and converting concentrations
- General characteristics (mainly chemistry) of basic industrial inorganic technologies
- Drawing documentation of technical and technological projects
- Ability to read technical drawings
- Basic principles of technical drawing
- Calculations with floating point numbers, limitations and common causes of errors
- Parallel processing: computing load, critical resources, race conditions
- Analytical chemistry - quantitative titration analysis (volumetric)
- Analytical chemistry - quantitative weight analysis
- Analytical chemistry - basic activities in quantitative chemical analysis
- Chemical reactions that are the basis of chemical quantitative analysis
- Laboratory equipment used in analytical chemistry
- Alcohols
- Carboxylic acid derivatives
- Nucleophilic and electrophilic substitution
- Hydrogenation
- Oxidation
- Laws of thermodynamics
- Thermodynamic potentials, thermodynamic functions, thermodynamic relations
- Thermochemistry
- Phase equilibria and phase transitions of single and multicomponent systems
- Chemical reaction equilibrium
- Solutions - physicochemistry and thermodynamic description
- Thermal machines
- Flows
- Preparation of samples for analysis
- Atomic absorption spectrometry
- Atomic emission spectrometry
- Gas and liquid chromatography
- Electroanalytical techniques
- Construction materials
- Iron alloys - the effect of added elements

- Basic principles of designing pressure and non-pressure vessels and technical requirements for process equipment
- Normal and tangential stresses, strength of materials
- Problems of stretching, compression, bending, torsion and buckling of machine elements
- Adsorption
- Colloidal systems
- Reactions and reaction kinetics
- Catalysis
- Photochemistry
- Construction, principle of operation of the apparatus for the processes of momentum, heat and mass exchange
- Calculation of pumps
- Uncertainty of measurement
- Measurement errors, methods of measurement errors analysis
- Estimation of statistical parameters
- Supermolecular structure - closed and open symmetry
- Condensed-phase diffusion and solid-phase reactions
- Thermodynamics of the process of nucleation and crystallization
- Relationships between the structure and properties of the condensed phase
- Identification and quantitative analysis by X-ray diffraction
- Mechanics of single-phase fluids
- Multiphase flows
- Heat transport
- Mass transport
- Diffusion-thermal separation of substances
- The theory of similarity and dimensional analysis
- Technological principles
- Technological process development stages
- Chemical reactions and their course
- Chemical reactors - perfect and real
- Mass and heat balances of chemical reactors
- Kinetics of a homogeneous reaction
- Criteria for selecting the reactor type and reactor operating parameters
- Characteristics of the heterogeneous catalysis process on the selected example
- Technology of mineral acids
- Ammonia technology
- Processes of synthesis gases conversion
- Methods of enriching natural resources
- Reactions leading to the production of polymers
- Structure of polymers
- Molecular weight of polymers
- Physical states and properties of plastics
- Processing methods and recycling of plastics
- Types of electrolytes, equilibrium in electrolyte solutions, transport of ions in various media and related issues of conductivity, diffusion and electrophoresis

- Types, classification and structure of electrodes, their production, characteristics and regeneration.
Electrode potential
- Electrolysis processes, electromotive force of cells, mechanisms of electrode reactions, kinetics of electrochemical processes, electrode polarization, construction of electrolyzers
- Electrochemistry in the synthesis of materials, in environmental protection, examples of electrochemical processes used to obtain various materials, compounds and chemicals, and in broadly understood environmental protection
- Production, storage and processing of energy with the use of electrochemistry
- Direct current circuits
- Electric phenomena in electrostatic and magnetic fields
- Electric machines, power and electricity
- Electrical metrology and metrology with electrical methods
- Semiconductor materials, electronic components, electronic circuits, logic circuits
- The chlorination process - type, factors, examples
- The nitration process - from synthesis to industrial production
- UV spectroscopy
- IR / FTIR spectroscopy
- NMR / 2D NMR spectroscopy
- Mass spectroscopy
- Raman spectroscopy
- Automatic control systems
- Setting and actuating elements
- Regulators
- Signaling, locks and security
- Measurements, measuring instruments and transducers
- Control of quantities and technological processes in technology and chemical engineering
- Mass balances of stationary processes without chemical reaction
- Mass balances of stationary processes with chemical reaction
- Technology of liquid crystal materials
- Photolithography and polymer resistors
- Piezoelectric and pyroelectric compounds
- Characteristics of materials used in medicine and pharmacy
- Nanotechnology and nanomaterials
- Methods of hazard identification and risk analysis in the process industry
- Legal foundations of process safety in Poland
- Main causes of accidents in the process industry
- Flammability and explosiveness of pure substances and mixtures
- Process analysis
- Process gas chromatography
- Process liquid chromatography
- Non-chromatographic process control techniques