

Subject Area: CHEMICAL ENGINEERING AND ADVANCED MATERIALS

M. Sc. Program: DISPERSE SYSTEMS IN CHEMICAL TECHNOLOGIES

1. Educational objectives

To train experts with in-depth understanding of the physical and applied chemistry of disperse systems (suspensions, emulsions, foams, molecular aggregates of synthetic and natural surfactants), who are capable of building new knowledge and skills for the practical application of various disperse systems in advanced chemical technologies.

2. Description

(A) General requirements – knowledge and skills: Profound knowledge in chemistry, especially physical chemistry of dispersed systems and colloid chemistry; competences and skills to work in high-technology research, development and production in their field of expertise; capabilities to communicate freely in relation to scientific research and chemical technologies; well-developed ability for team work; competences in computer-aided calculations and modelling.

(B) Special requirements – knowledge and skills: In-depth understanding of chemistry, physical chemistry of disperse systems and colloid chemistry, the main emphasis being on: colloid stability; mechanisms and processes of colloids formation, separation and purification, and technological applications. Profound knowledge in fundamental chemical engineering aspects, such as mass and heat transport, rheology, chemical kinetics, separation processes, and computer modelling of disperse systems and of the processes involving such systems. Detailed knowledge of the structure and chemical composition of the basic colloid systems and how this structure affects their mechanical, electrical, optical, rheological and other properties; critical awareness of methods for structure and properties characterization. General knowledge of the basic approaches for disperse systems preparation and applications in chemical, food and pharmaceutical technologies, for their use in advanced materials fabrication (ceramics and other high-tech materials) and for purification of waste and drinking water, and of aerosols.

3. Professional Qualifications

Specific knowledge, skills and competences for fabrication and characterization of disperse systems; formulation and characterization of complex and heterogeneous in composition or structure chemical products. Analysis and control of the processes involved in colloid system production, purification and separation, and of the processes governing their stability.

4. Professional Realization

(A) General kinds of professional activity: Participation in research and development or production activity in the field of Chemistry or Chemical Engineering, especially in relation to disperse systems, colloids, or physical chemistry. The alumni can continue their education in PhD programs, or they can work in public and private research institutes, in academic institutions or in industry; they can create a startup company for production, characterization and modification of colloid systems with applications in cosmetics, homecare, food and pharmaceuticals products, ceramics, environmental protection, and air/water purification. The graduate students can also work in fields, which require professional understanding of chemical engineering and/or physical chemistry of colloid systems.

(B) Special kinds of professional activity: Participation in applied or fundamental research, development and incorporation of new and advanced technologies for production optimization and/or processing of disperse systems; design of new formulations of cosmetic products, detergents, paints, pharmaceuticals, food and homecare products, based on colloid systems. The alumni can develop, improve, adapt and apply new and advanced methods for analysis and characterization of the structure and properties of disperse systems, and of complex and heterogeneous in composition or structure chemical products.

5. Admission requirements

The candidates should have a solid background in university-level mathematics (for chemical engineers), physics, chemistry, transport phenomena, unit operations, basic information technologies, acceptable command of English. These prerequisites correspond to the level of the graduate students from the BSc program “Chemical engineering and advanced technologies” at the Faculty of Chemistry and Pharmacy of Sofia University “St. Kliment Okhridski”, the chemical engineering and technological majors of the University of Chemical Technologies and Metallurgy in Sofia, the University “Asen Zlatarov” – Burgas, or other similar chemical engineering or chemistry majors in Bulgaria and abroad. In particular cases, depending on the disciplines studied at the BSc level, candidates could be admitted after graduating BSc in food technologies or MSc in pharmacy.