Course Unit Descriptor

**Study Programme:** Biotechnology and Chemical Engineering

**Course Unit Title:** Bioseparations Engineering

**Course Unit Code:** O7BIO1

**Name of Lecturer(s):** Dr. Mirjana Antov, Full Professor

**Type and Level of Studies:** Undergraduate academic studies

**Course Status (compulsory/elective):** compulsory for Biotechnology, elective for Chemical Engineering

**Semester (winter/summer):** Winter

**Language of instruction:** English

**Mode of course unit delivery (face-to-face/distance learning):** Face-to-face

**Number of ECTS Allocated:** 6

**Prerequisites:** None

**Course Aims:**

Course in Bioseparation Engineering enables students to gain fundamental scientific and academic knowledge, capabilities and skills in both theory and practice of separation processes in bioengineering, understanding of bioseparations processes and principles of their organization in bioseparations train for isolation and purification of biological materials and molecules.

**Learning Outcomes:**

Knowledge of fundamental principles of bioseparations processes, techniques and methods that enable high and low resolution in bioseparations, criteria of choice of technique and equipment for separation of biological materials and molecules, knowledge of principles of bioseparations train organization and integration.

**Syllabus:**

*Theory*

General and specific requirements regarding separation of biological materials and molecules. Economics of bioseparations processes. Classification and properties of biomaterials and biomolecules relevant for bioseparations. General categories of bioproducts and criteria of choice for initial recovery. Methods of cell disruption, criteria of choice and kinetics of release of intracellular molecules. Sedimentation, centrifugation and filtration in bioseparations. Membrane separations of biological materials and molecules. Adsorption, precipitation, crystallization and extraction in bioseparations. Bioseparations in aqueous two-phase systems. Liquid chromatography in bioseparations. Calculations of productivity of chromatographic column. Scale-up in liquid chromatography. Gel permeation, hydrophobic and chromatography on reversed phase, ion exchange chromatography and affinity chromatography in bioseparations. Criteria of choice, equipment and case studies. Basic principles of organization and integration of bioseparations train.

*Practice*

Subjects from theory are covered by calculations and lab exercises. Presentation of students' seminar work.

**Required Reading:**


1. M. Antov: Bioseparations Engineering (in Serbian), Faculty of Technology, Novi Sad, 2010.
2. M. Antov: Aqueous two-phase systems: principles of partitioning and application (in Serbian), Faculty of Technology, Novi Sad, 2006.
3. M.R. Ladisch: Bioseparation Engineering: Principles, Practice and Economics, Wiley, 2001
4. M.C. Flickinger (Ed.): Downstream Industrial Biotechnology, Wiley, 2013.

5. J.D. Seader: Separation Process Principles, Wiley, 2006.

| **Weekly Contact Hours: 6** | **Lectures: 3** | **Practical work: 3** |
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**Teaching Methods:**

Lectures, calculations and students' lab exercises, presentations of students' seminar works. Educational tour to industry.

**Knowledge Assessment (maximum of 100 points):**

| **Pre-exam obligations** | points | **Final exam** | points |
|---|---|---|---|
| Active class participation | 5 | written exam | - |
| Practical work | 25 | oral exam | 30 |
| Preliminary exam(s) | 20 | ……. | |
| Seminar(s) | 20 | | |

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.