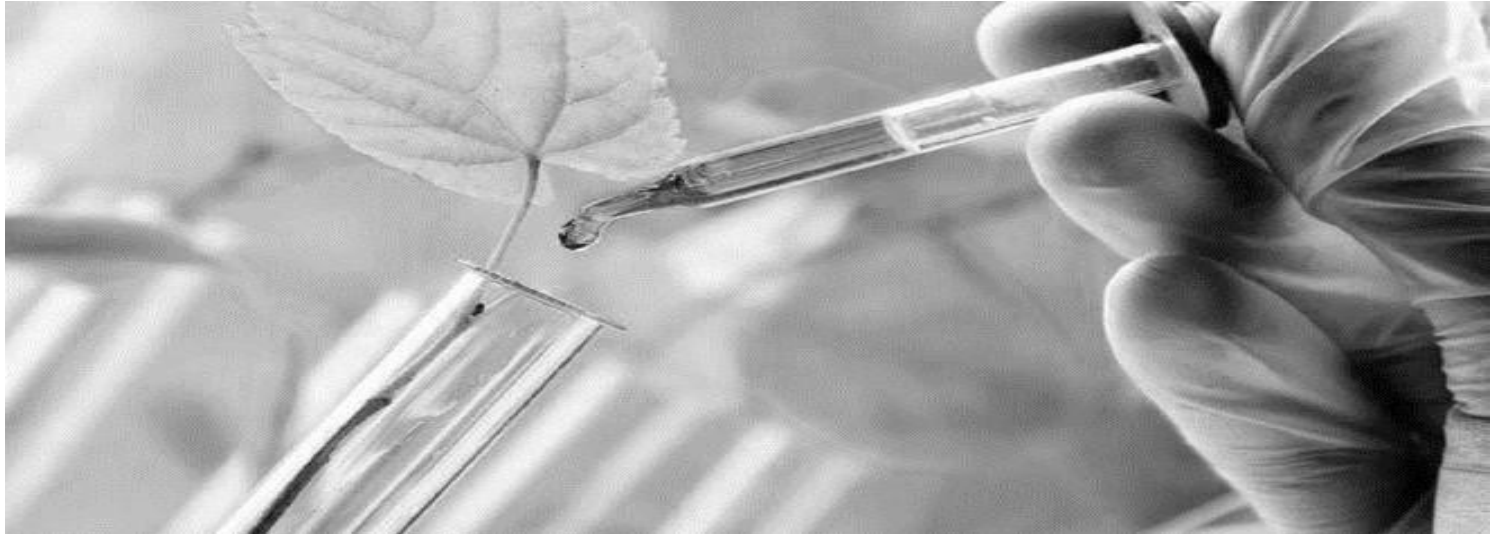


Branch: Chemistry and Chemical Engineering



Code: MOLBIO

Option: Molecular biotechnology

Level: Master

Prerequisites:

Opportunities

After graduation, it is possible for graduates to do a PhD or to enter the biotechnology industry directly:

Medicine - development of pharmaceuticals and therapeutics, refinement of diagnostics and development work at interfaces, e.g. prostheses, tissue substitutes.

Industrial biotechnology - development of new processes and materials (also from renewable raw materials)

Agriculture - genetically modified plants and animals, modified micro-organisms

Description:

The Master's program in Molecular Biotechnology focuses on the extraction and construction of natural and artificial biomolecules, which are thus at the heart of "molecular" biotechnology. The Master's program expands on existing prior knowledge with in-depth specialist and methodological knowledge. What is the focus of this course of study?

Classical biotechnology has been mainly devoted to the production process and related procedural issues (such as fermentation, separation processes, etc.).

However, in the era of genetic engineering, it has become much easier to optimize the biosynthetic performance of the cell itself. In addition, the efficient construction and synthesis of artificial biomolecules with improved or completely new functions (protein design) has also become possible. Here you will find links to the new research field of synthetic biology. The technical know-how and the resulting added value for a commercial enterprise therefore no longer lie primarily in the production process, but increasingly in the structure and function of the (specifically manipulated) biomolecule or genetic material of the producing cell (or organism). This field of work therefore requires the interdisciplinary use of methods from genetic engineering, protein chemistry, biophysics and bioinformatics.

Molecular" biotechnology therefore focuses on the biomolecules themselves. In particular, it concerns macromolecules - in addition to lipids and metabolic intermediates (metabolites) - and the cells that synthesize them. Cells, whether microorganisms or cultured cells of animals or plants, are not only of interest as producers but also as objects of study.

Technical instruments and tools play a major role in molecular biotechnology, ranging from state-of-the-art physical measuring devices to fermentation facilities and computational methods (molecular modelling and bioinformatics). The interdisciplinary character of this bioscience program is thus reflected in the five thematic pillars on which the Master's program is based: Biomolecules, Cells, Organisms, Medicine and Technology.

Quality and competences:

On completion of the Master's program, students in molecular biotechnology are able to assess complex scientific questions in the field of biotechnology and molecular biology and their related fields, to structure approaches and to evaluate research results. Thus, they also have the basis for acquiring the capacity for independent scientific work in a subsequent thesis. They have knowledge in particular fields such as protein engineering, molecular microbiology or structure-based bioinformatics and are able to apply, transfer and write up this knowledge. In particular, on the basis of this course, students are able to independently identify research questions in the development and application of biotechnological and biochemical issues, to set up in-depth studies on them, to critically question the results and to analyze and further develop them. For example, they can contribute to the field of protein design in the development of biological agents for the treatment of serious diseases. They

are able to understand the structure and properties of a protein, and from this they can design approaches to modify the protein functionally or to obtain the structural information required in the first place. Other skills acquired include molecular biological methods, such as genetic analysis and cell culture techniques, or enzymatic processes and their theoretical underpinnings, which are used in both research and industry. The application-oriented teaching is particularly advantageous, as it enables graduates of the Master of Science in Molecular Biotechnology program to quickly become familiar with complex tasks.