

## **Biotechnology (MSc)**

### **Course Language(s)**

Courses are taught in English.

Students who do not have a Bachelor's degree in Biotechnology or Biochemical Engineering will have to complete additional courses in Biotechnology. These courses are in German.

Students can choose to write their Master's thesis in English or German.

### **Beginning of Programme**

Winter semester - September

Summer semester - March

### **Programme Duration**

3 semesters (1.5 years)

### **Application Deadlines**

December 01 – January 15 for the following summer semester

April 01 – July 15 for the following winter semester

### **Programme modules**

1 - Applied Mathematics: including the courses "Numerical Mathematics" and "Data Acquisition and Processing"

2 - Bioprocess Automation: including lectures and special practical courses on this subject

3 - Bioprocess Engineering: including lectures and practice in "Analysis, Modelling & Simulation of Bioprocesses" and "Advanced Biochemical Engineering"

4 - Advanced Cell Biology and Microbiology: including courses in "Biogas Engineering" as well as lectures and lab courses in "Cell Culture Techniques"

5 - Advanced Biochemical Analysis: including lectures and lab courses in "Instrumental Analysis 2" and a course in "Flow Injection Analysis"

6 - Product Purification: including the courses "Integrated Purification Techniques", "Introduction in GMP", and "Drug Development & Formulation", and a lab course in "Integrated Purification Techniques"

7 - Biotechnological Projects: including the "Laboratory Project" and the "Research Seminar"

8 - Master's thesis

Soft skills are trained in the various modules and particularly in the seminar.

### **Programme Organisation**

Modules 1, 7 and 8 are offered both in the summer and winter semesters. The modules 3 and 6 are offered in the winter semester, module 2 is offered in the summer semester. The courses in the remaining modules take place in both the summer and winter semesters.

### **Forms of Assessment**

Written examinations, seminar papers, reports, oral examinations, presentations

### **Course objectives**

The Master's programme in Biotechnology is a consecutive, discovery-led course with a strong link to pharmaceutical biotechnology. It is aimed at improving professional knowledge in the area of industrial biotechnological processes, considering new insights into molecular biology and cell culture techniques as well as in bioanalytics.

Students will be able to monitor biotechnological processes using sophisticated online instrumentation. They will be introduced to the fundamentals of system theory, in order to analyse and to critically question existing biotechnological processes. Consequently, this will allow the simulation of biotechnological processes as well as process controlling strategies with the aid of computer programmes. Sound knowledge will be gained for the production of recombinant biotechnological products by prokaryotic and eukaryotic cell lines and employing the most adequate cultivation strategies. Modern molecular bio-analytical methods are also on the timetable.

Students look at the specific characteristics of the purification and stabilization of proteins, polynucleotides and other biologically active agents, focusing on industrial conditions. An insight into the development of protein pharmaceuticals and other active ingredients based on biotechnologically-derived molecules is given, analytical techniques in the pursuit of product and metabolites are among the objectives.

Graduates will be able to isolate problems in a new area of expertise or such an area in development and to encircle the most probable solution approach. They have the continuing ability of composing new process strategies as well as process controlling strategies for biotechnological processes and to transfer these strategies into industrial production. They can work both in the areas of production or development in industry or in research institutes. Graduates are able to conduct independent scientific research and have the skills to continue with advanced research in order to acquire a Ph.D. qualification.

#### **ECTS Credits**

90

#### **Language Requirements**

##### **English:**

TOEFL at least 550 (paper-based), 220 (computer-based), 83 (internet-based); IELTS at least band 6 or equivalent

##### **German:**

**Applicants with a Bachelor's degree in Biotechnology or Biochemical Engineering:** All the modules in the Master's programme are in English. Applicants must have German A2.

**Applicants who don't have a Bachelor's degree in Biotechnology or Biochemical Engineering or have only 180 credit points:** Additional modules in Biotechnology have to be taken in order to have sufficient knowledge to complete the Master's programme. These modules are taught in German. Applicants must have German B2 or TestDaF 3.

##### **Academic requirements**

Bachelor's degree (or equivalent) in the same or similar field, with the academic grade equivalent to the German grade 2,5

##### **Professional / other requirements**

Graduate Record Examination (GRE) (for applicants from non EU-countries)