University of Basel

Faculty of Science

Degree Profile

Master in Molecular Biology

Organizational unit	Faculty of Science, Department Biozentrum
Degree	MSc Molecular Biology
Range, Duration, Start	90 ECTS, 3 semesters (if full-time), spring or autumn semester
Language of instruction	English

Program Goals

Students develop solid theoretical and practical knowledge of the discovery, progress and efficacy of biological research in their areas of specialization (Biochemistry, Biophysics, Cell Biology, Computational Biology, Developmental Biology, Genetics, Immunology, Infection Biology, Microbiology, Neurobiology, Pharmacology and Structural Biology). They demonstrate their capacity to conduct their own research project by presenting the scientific results in written and oral form.

Program Characteristics

Orientation	Scientific-oriented education
Subject area	Biology
Majors	–
Program Structure	The curriculum consists of the modules: Master's thesis (50 ECTS), Master's examination (10 ECTS), courses (30 ECTS, of which 18 ECTS must be taken within the molecular biology course offerings).
Distinctive Features	Research at the Biozentrum is grouped into five focal areas of investigation: Growth & Development, Infection Biology, Neurobiology, Structural Biology & Biophysics and Computational & Systems Biology. All research groups share the main focus to understand the molecular organization of living organisms. The focal areas interact collaboratively, sharing concepts, ideas and technologies. The Biozentrum emphasizes a strong focus on research and the close guidance of its students.

Career Opportunities

Employment	Fields of biology, medicine, biotechnology and pharmaceutical industries, higher education research, government service, teaching
Further Studies	Doctorate, teaching diploma for secondary schools

Teaching

Approaches	Individual learning, problem-based learning, autonomous learning, research-oriented learning
Assessments	Oral and written examinations, written Master's thesis, oral Master's examination

Competences

Generic Attitude / Communication Approach / Management	Students acquire the skills to … – carry out independent and creative scientific research. – study scientific literature and understand scientific concepts. – work in a team environment. – communicate ideas and results effectively in English language. – lead discussions and deal constructively with criticism. – organize the scientific work process efficiently through prior planning and priority setting. – present scientific results and theories orally and in written form to specialist as well as public audiences. – deal responsibly with ethical aspects of the scientific work. – write a concise and well-structured scientific text. – formulate hypotheses and test them through experimentation. – analyze and document experimental data.
Subject-related Knowledge / Understanding Application / Judgment Interdisciplinarity	Students acquire the skills to … – understand and apply advanced scientific concepts in Molecular Biology, in particular from their biological area of specialization. – describe simple and complex biological systems qualitatively and quantitatively. – understand advanced biological laboratory practices, analyses and experimental methods and apply them independently. – apply software programs to describe biological systems quantitatively. – understand how modulations of biological systems on the molecular level, including single point mutations, can result in phenotypic variation. – understand the mechanisms of evolution as the driving force for biological diversity, on the molecular and the organismic level. – appreciate biophysical and biochemical laws as the underlying rules governing the functioning of biological systems.

Learning Outcomes

Graduates of the master's program in Molecular Biology...

- possess the ability to appropriately apply current high-level computer technology to solve complex quantitative research problems in their discipline of specialization completely.
- are able to select independently appropriate advanced techniques, theories and scientific concepts in Molecular Biology to systematically develop a scientific hypothesis and test through experimentation.
- understand the mechanisms of evolution on the molecular and organismic level as the fundamental basis for biological diversity and are able to apply this knowledge adequately and correctly.
- are able to correctly describe the technical details of experimental methods in accordance with a specified research problem and adapt them appropriately to new research questions and to different systems in order to provide scientifically-grounded positive and negative arguments for a given experimental research approach in the discipline of specialization.
- possess a broad and profound scientific knowledge of the fundamental theories underlying Molecular Biology, in particular in their area of specialization, and are able to appropriately apply this knowledge to perturb or manipulate biological systems as well as systematically and correctly quantify the resulting changes.
- are able to independently carry out a complete research project in the field of Molecular Biology, including literature searches, the framing of research questions in the context of current research of the field, conduct appropriate experimental work and laboratory practices, and can clearly and concisely present their results to peers as well as to the public in written and oral form according to scientific standards.
- understand the ethical aspects of their research work and can distinctly argue for the appropriate and responsible use of the scientific necessity of methods, such as animal experiments, handling of pathogenic organisms, genetic modification of organisms or embryonic stem cell research.