CERTIFICATE IN MOLECULAR BIOLOGY AND BIOTECHNOLOGY

The Certificate in Molecular Biology and Biotechnology is designed to better prepare undergraduate and post-baccalaureate students interested in pursuing the following areas:

1. Advanced degrees molecular biology or applied biosciences and bioengineering.
2. Professional degrees in biomedical sciences, biochemistry and gene technology programs.
3. Employment in industry with a focus on biotechnology.

Many of the advances in Biological Sciences in the second half of the 20th century and the first decades of the 21st century have occurred in the fields of molecular biology and genetics. We have entered an era where genomic sequencing and the examination of entire biological systems is commonplace. In this era of genomic sequencing and genetic engineering of a whole host of organisms a knowledge of Molecular biology is essential. The Bachelor of Science in Molecular Biology and Biotechnology is designed to prepare students for careers in fields where an in depth knowledge of molecular biology and biotechnology are needed.

The current Bachelor of Science in Biological Sciences is very broad. No clear track to knowledge and skills in Molecular Biology and Biotechnology is discernable. In this program students will be prepared for research or technically intensive graduate programs and career positions requiring a knowledge set and expertise in molecular biology/ biotechnology. Also students from this program that choose a public policy career will be better informed of the issues facing society in regards to molecular biology than their peers.

This program is aimed to be an interface between fundamental basic sciences and applied sciences. The degree will require almost no additional resources from the University. The Department of Biological Sciences and the STEM college already have the faculty, research base, and courses to implement this program. The Bachelors degree in Molecular Biology and Biotechnology will simply clarify for students a pathway to acquiring a specific set of skills and knowledge that are already available at Youngstown State University.

The B.S. Certificate in Molecular Biology and Biotechnology is designed to give the student a competitive edge in obtaining career opportunities in pharmaceuticals, biomedical, biotechnology, recombinant DNA technology based fields as well a broader opportunities. This is a research and techniques focused curriculum that emphasizes the molecular biology sciences.

Criteria for admission to the certificate program: Due to the research-intensive aspects of this program, a limited number of competitive candidates will be selected for participation in the Certificate. Minimum requirements for admission to the Certificate in Molecular Biology and Biotechnology are; 1) completion of the prerequisite course in the certificate curriculum and 2) a **3.0 GPA.** Admission to the program is determined by the program coordinator (Departmental Chair) after review of formal application.

To receive the certificate in Molecular Biology and Biotechnology, students must complete 35-38 semester hours and maintain a grade point average of 3.0 or better in their required and elective courses in the certificate program.

Prerequisites for admission to the Molecular Biology and Biotechnology certificate.

These prerequisite courses are designed to select for the students that will be successful in the molecular biology and biotechnology fields. They all apply to the BS or BA degree program.

COURSE	TITLE	S.H.
BIOL 2601 & 2601L	General Biology 1: Molecules and Cells and General Biology I: Molecules and Cells Laboratory	4
BIOL 2602 & 2602L	General Biology 2: Organisms and Ecology and General Biology: Organisms and Ecology Laboratory	4
BIOL 3721	Genetics	3
BIOL 3702 & 3702L	Microbiology and Microbiology Laboratory	4
OR		
BIOL 3711	Cell Biology: Fine Structure	3
Total of Prerequisites BIOL courses: 14-15 s.h.		

Required Certificate Courses

COURSE	TITLE	S.H.
BIOL 4890	Molecular Genetics	3
BIOL 4800 & 4800L	Bioinformatics and Bioinformatics Laboratory	4
BIOL 4850 A-Z Problems Course. Pick one course number specific to the topic/instructor		**1 s.h. then 2 s.h. with same instructor**
BIOL 5827	Gene Manipulation	2
CHEM 3785	Biochemistry 1	3
or BIOL 4829	Microbial Physiology	
Subtotal of required BIOL courses: 15 s.h.		

Biochemistry 1 can replace the chemistry recitation sections in satisfying the Chemistry minor. These courses are designed to give the student a firm foundation for molecular biology and the applied sciences in molecular biology.

Elective certificate BIOL courses. Pick at least two lecture courses and one lab course from the following (6-8 s.h.)

COURSE	TITLE	S.H.
BIOL 3759	Evolution	3
BIOL 3703	Clinical Immunology	3
BIOL 3703L	Clinical Immunology Laboratory	1
BIOL 4890L	Molecular Genetics Laboratory	1
BIOL 4837		1
BIOL 4836		3
BIOL 4801 & 4801L	Environmental Microbiology and Environmental Microbiology Laboratory	4
BIOL 3730	Human Physiology	4 or 3 or 3
or BIOL 3745	Plant Physiology	
or BIOL 4829	Microbial Physiology	
BIOL 4893		2
BIOL 4822	Principles of Pharmacology	3
BIOL 4823	Cancer Biology	2
BIOL 4848	Biology of Fungi	3
BIOL 5823	Advanced Eukaryotic Genetics	3

BIOL 5840	Advanced Microbiology	3

Subtotal of elective BIOL courses: 6-8 s.h.

Learning Outcomes

- The student will learn research approaches to modern questions in molecular biology by experiencing a research intensive environment.
- The student will learn and master scientific approaches and perspective of problems involing the molecular biology of living organisms. With his molecular perspective and context, will develop in the student a high level of problem solving ability.
- The student will become skilled in biotechnology techniques and methods.