GENERAL INTRODUCTION OF THE FACULTY OF BIOLOGICAL SCIENCES

(EMAIL: KKHSH@HCMUAF.EDU.VN - WEBSITE: HTTP://BIOTECH.HCMUAF.EDU.VN)

I. Introduction

History: The Faculty of Biological Sciences (formerly the Department of Biotechnology under the University) was established in 2001 with the initial mission of training Biotechnology engineers. Currently, the Faculty is providing undergraduate training programs in Biotechnology and Environmental Biotechnology. These study programs were harmonious combinations of traditional agricultural background and advanced technologies in the field of gene recombination, fermentation, cell biology, microbiology, biochemistry and embryology. The laboratories at the Faculty of Biological Sciences and at the Institute of Biotechnology and Environment have been equipped well and continuously supplemented with mordern and high –quality machines and devices, serving for research and teaching. Our Biotechnology program has been accredited AUN-QA standard (ASEAN University Network) in 2019.

Vision to 2030: The Faculty of Biological Sciences has orientated itself toward one of the most distinguished biotechnology centers of Southeast Asia.

Mission: Mission of NLU Faculty of Biological Sciences is to train qualified and acknowledged experts in fields of biotechnology, applied biology and environmental biotechnology at undergraduate and graduate, to apply biological techniques in high-tech agricultural area, habitat preservation and to develop new bio-products to serve the community.

General objectives: (1) Continuously enhancing the quality of biotechnology education on par with other prestigious universities in the Southeast Asia and globally; (2) strongly promoting basic research and application; (3) actively transferring science and education products to commercial sectors; and (4) being a leading partner with other national and international units working on biotechnology.

Specific Objectives: (1) To train highly-qualified human resources involved in biology, biotechnology and environmental biology in the Southeast Asia. **(2)** To disseminate biotechnological knowledge and techniques into commercial sectors, especially in three regions of Vietnam: Southern, Central and Highland. **(3)** To increase a cooperation and development in education, research and technology transfer with national and international universities, research institutes, enterprises/companies in the fields of biology, biological technology and environmental biology.

II. Structure of the Faculty

Currently, the Faculty of Biological Sciences includes 4 departments:

1/ Department of Biotechnology

2/ Department of Environmental Biotechnology;

3/ Applied Biology Department

4/ Applied Microbiology Department

III. Typical research direction

1/ Department of Biotechnology

- Based on genetics, molecular biology, selection and improvement of plant varieties, livestock, microorganisms, fungi... to create new varieties with more superiority;
- Creating biological products used in disease prevention and treatment, environmental protection;
- Create diagnostic test kits for diseases detection in human, livestock and plants...

2/ Department of Applied Biology

- Study the biology, biochemistry and pharmaceutical chemistry of microorganisms, plants and animals;
- Studies applied in: nature protection, conservation programs, health protection, productivity of crops, livestock and people.

3/ Department of Applied Microbiology

- Research on the prevalence, diversity and influence of microorganisms in natural environments as well as adulteration in food causing disease in human and animals.
- Acquiring biologically active compounds from environmental microorganisms in nature.
- Developing products from microorganisms and applying in agriculture, food and medicine.

4/ Department of Environmental Biotechnology

- Research to improve and protect the environment of air, water, and land for application in aquaculture, agricultural production, food production...
- Assessment of the environmental impact on organisms
- Study the potential use of organisms in the treatment of environmental pollution; as a source of nutrients in animal and aquaculture feeds; creating biofuels; production of cosmetics and functional foods for humans.

IV. Education program

4.1. Levels of education programs

- Undergraduate: includes two programs, Biotechnology and Environmental Biotechnology. Each program consists of 158 credits, which learners can complete in 7-8 semesters.

- Graduate (Master and PhD): Biotechnology program

+ Master program: 2 years

+ Doctoral program: 4-5 years

4.2. Program objectives and expected learning outcomes

4.2.1. The program objectives (POs)

4.2.1.1. Common objectives

- Training human resources with professional knowledge of biology and biotechnology; proficiently use specialized equipment and tools in research and production of biological products; Capable of keeping up to date with advances in modern biology.

- Training human resources capable of applying biotechnology in many fields such as health, medicine, agriculture, forestry, fishery, food and environment.

- Ethics - Creativity - Integration is the guideline for the goal of training high-quality human resources in biotechnology to meet domestic and international needs.

4.2.1.2 Program objectives (POs)

The training program helps learners achieve the following specific goals:

- **PO1:** To understand the origin of life based on biological knowledge at the molecular and cellular level
- **PO2:** To apply biological techniques in basic research and applied research in the field of Biotechnology.
- **PO3:** To develop and implement research proposals in the field of Biotechnology.
- **PO4:** To create biological products that meet social needs.
- **PO5:** To understand ethical standards and master professional skills to be able to adapt to the highly competitive working environment as well as eintegrate themselves to the international working environment

4.2.2. Program learning outcomes

4.2.2.1 Knowledge

General knowledge

- **PLO1**: To understand the basic knowledge of the natural sciences, social sciences, and biological processes related to life and living environment

- **PLO2**: To comprehend basic principles of molecular, biochemical, microbiological and cellular techniques.

Professional knowledge

- **PLO3**: To comprehend basic methods in scientific research of biology
- **PLO4**: To understand basic biological techniques and operating principles of biological devices in research and production of biological products.

4.2.2.2 Skills

General Skills

- **PLO5:** To organize the network and research group as well as implement the proposed projects.
- **PLO6:** To analyze and resolve realistic issues using biological knowledge, techniques and tools.

Professional Skills

- **PLO7:** To apply basic principles of biotechnology to develop new and highly competitive products.
- **PLO8:** To build technological processes creating biological products for the community and the society.
- **PLO9:** To deliver basic to advanced knowledge and techniques related to biology to learners.

4.2.2.3 Attitudes

- **PLO10:** To implement responsibility to the society, dbeing self-concious of community-based lifelong learning and start-up business.
- **PLO11:** To implement professional ethical standards, rules and regulations of national and international law.

4.3. Admission criteria to the program

Name of the program: Biotechnology

Code of the program: 7420201

Degree awarded: Engineer in Biotechnology

Admission criteria to the program: The students who wish to attend the program have to pass a national entrance examination held by the MoET, and their exam scores must be equal or higher than the standard scores from combination of one of subject groups A00 (Mathematics, Physics, Chemistry), B00 (Mathematics, Chemistry, Biology), or A02 (Mathematics, Physics, Biology). Candidates can be also admitted to the course depending on special awards.

4.4. Employment opportunities

Biotechnology is the field of research and application of knowledge about genes, genomes of organisms to create new biological products that are more useful for human life, animal welfare and environment protection. For example, biotechnological research of genetics creates new varieties of plants and animals with more advantages in yield, disease resistance and tolerance to extreme conditions; technology in microbiology helps to find or create beneficial bacteria for humans, animals, plants, and environment; DNA recombinant technology supports production of biological products like diagnostic kits, vaccines against infectious diseases such as Covid-19, African swine fever; or medicinal products such as insulin for diabetics, anti-cancer antibodies...

Basic and specialized knowledge combined with professional and soft skills obtained during the training program provide learners adaptability to different working environments such as teaching in schools, colledges or universities; researchers in institutes or research centers; serving as technical-sales staff in companies/enterprises producing and trading biological products; being specialists to perform diagnostic works in hospitals, veterinary clinics...; or after graduation, the learners can start their own business with biotechnological products such as plant tissue culture, edible mushrooms, medicinal mushrooms, diagnostic services...

According to previous survey, approximately 75% of students graduating in 4 years, 8.6% in 5 years, and especially 10.8% within only 3.5 years. The results show that the education program is flexible, learners are able to adapt and choose self-determination curriculum for sharpening their knowledge and skills. The employment rate of graduates after 6 months is 83% and after 1 year is 93%. This reflects the fact that Bio’s education quality is appropriate with current employers’ needs, despite the fact "soft skills along with foreign language" is still Bio engineers’ obstacle to job application. A wide spread of job opportunities, 40% of jobs related to agriculture, 31% related to pharmacy, medical testing, and 7% of microbiology lab work, demonstrate that biotechnology education has been serving the social needs.

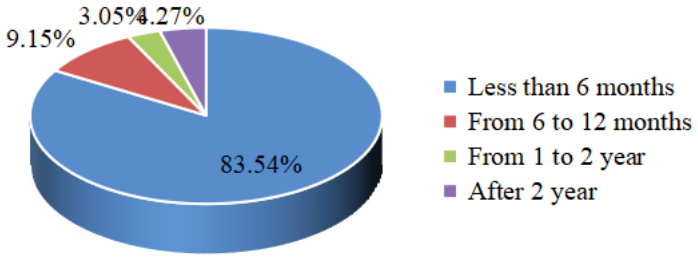

Figure 1. The percentage of students having jobs after graduation (2017).

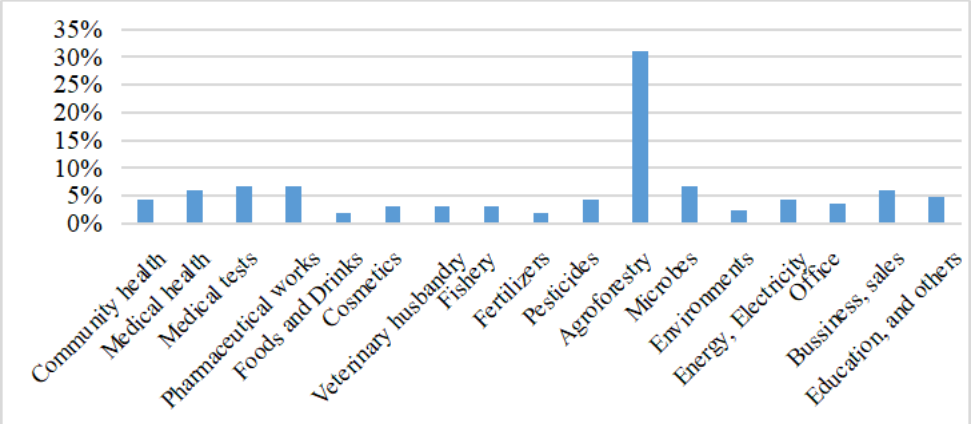

Figure 2. Working field of a bachelor of biotechnology (2017).

4.5. Program curriculum

4.5.1. Environmental Biotechnology program

No	Subject code	Name of courses	Credit number
1. General courses			
Compulsory courses			
1	200101	Philosophy of Marxism and Leninism	3
2	202113	Advanced Mathematics B2	2
3	202201	General Physics 1	2
4	202301	General Chemistry	3
5	202304	General Chemistry Laboratory	1
6	202401	General Biology	2
7	202402	General Biology Laboratory	1
8	202501	Physical Education 1	1

9	202622	General Law	2
10	213603	English 1	4
11	200102	Political Economics of Marxism and Leninism	2
12	200201	Military training (theory)	3
13	200202	Military training (practice)	3
14	202121	Probability and Statistics	3
15	202502	Physical Education 2	1
16	211409	Introduction of Environmental Biotechnology	2
17	213604	English 2	3
18	214103	General Informatics	3
19	200103	Scientific Socialism	2
20	212104	Environmental Ecology	2
21	211407	Introduction to Ecological Technology	2
22	200107	Ho Chi Minh Ideology	2
23	200105	History of Vietnamese Communist Party	2
Total			**51**
2. Fundamental courses			
Compulsory courses			
1	211123	English for Biotechnology 1	1
2	211140	Essential Skills in University Research and Education	2
3	211141	Biological Laboratory Safety Management	2
4	211308	Environmental Chemistry and Toxicity	3
5	211124	English for Biotechnology 2	1
6	211138	Microbial Biology	2
7	211139	Experiment in Microbial Biology	1
8	211323	Laboratory Practice in Environmental Toxicity and Chemistry	1
9	211412	Pollution and Public Health	2
10	211319	Environmental Pollution Assessment	2
11	211106	Molecular Biology	4
12	211111	Fermentation Technology I	3
13	211410	Bioremediation	2
14	211431	Biomass Transfer Technology	2

15	211443	Laboratory Practice in Biomass Transfer Technology	1
16	211113	Genetics Engineering I	3
17	211402	Biotechnological Equipment and Techniques	3
18	211418	Bioindicators	3
19	211906	Research Methodology	3
20	211520	Biochemistry of Wetlands	2
21	211134	Biodiversity and Conservation of Genetic Resourses	2
22	211910	Bioproduct Business	2
Total			**47**
Elective course grouped in 0201 - Must obtained 3 credits			
1	211441	Bioenergy	1
2	211413	GIS in Environmental Biology	2
3	211414	Pollution and Marine Organisms	2
Total			**5**
Elective course grouped in 0202 - Must obtained 1 credit			
1	*211912*	Practice in Laboratory Research Methods	*1*
2	*211913*	Practice in Farming Research Methods	*1*
3	*211914*	Practice in Field Research Methods	*1*
Total			**3**
3. Specialized courses			
Compulsory courses			
1	211430	Soil and Soil Degradation	2
2	211129	Technical Drawing	1
3	211130	Experiment in Technical Drawing	1
4	211322	Laboratory Practice in Environmental Pollution	1
5	211101	Quality Management System	2
6	211211	Advanced Microbiology	2
7	211221	Laboratory Practice in Advanced Microbiology	2
8	211432	Algal Technology	2
9	211419	Laboratory Practice in Bioindicator	1
10	211521	Recombinant Enzyme Technology	2

11	211909	Bioproduct Development	2
12	211916	Internships	2
13	211408	Biosensors in Environmental Management	2
14	211441	Pollution Biomarkers for Human and Animals	3
Total			**25**
Elective course grouped in 0301 - Must obtained 2 credits			
1	*211126*	English for Biotechnology	*2*
2	*211127*	English for Environmental Biotechnology	*2*
3	*211142*	English for Medicine and Pharmacy	*2*
4	*211143*	English for Applied Biology	*2*
Total			**8**
Elective course grouped in 0302 - Must obtained 2 credits			
1	*211334*	Techniques for Plant and Animal Sample Analysis	*1*
2	*211436*	Techniques for Rock and Soil Sample Analysis	*1*
3	*211438*	Techniques for Water Sample Analysis	*1*
4	*211439*	Techniques for Air Sample Analysis	*1*
Total			**4**
Elective course grouped in 0303 - Must obtained 3 credits			
1	*211333*	Methods in Biochemical Testing	*1*
2	*211339*	Methods in SDS-PAGE, PFGE and DGGE	*1*
3	*211440*	Methods in Environmental Sampling	*1*
4	*211522*	Methods in Specimen Preparation	*1*
Total			**4**
Elective course grouped in 0304 - Must obtained 2 credits			
1	*211223*	Microbial Application in Pollution Treatment	*1*
2	*211446*	Wastewater Treatment Technology	*1*
3	*211516*	Waste Air Treatment Technology	*1*
Total for group			**3**
Elective course grouped in 0305 - Must obtained 3 credits			
1	*211428*	Insect in Treatment of Pollutants	*2*
2	*211444*	Solid waste Treatment Technology	*1*
3	*211445*	Municipal Treatment Technology	*1*

Total for group			**4**
Elective course grouped in 0306 - Must obtained 2 credits			
1	*211425*	Earthworm Application in Environment	*1*
2	*211427*	Nanotechnogy in Pollution Control	*1*
3	*211447*	Algal Application in Environment	*1*
4	*211448*	Phytoremediation	*1*
Total for group			**4**
Elective course grouped in 0307 - Must obtained 2 credits			
1	*211332*	Advanced Realtime PCR	*1*
2	*211437*	Atomic Absorption Spectrometry	*1*
3	*211503*	Advanced Chromatography	*1*
4	*211504*	Advanced ELISA	*1*
Total for group			**4**
Elective course grouped in 0308 - Must obtained 3 credits			
1	*211433*	Radiation and Environmental Effects	*1*
2	*211434*	Environmental Health and Extranuclear Inheritance	*1*
3	*211435*	Environmental Carcinogenesis	*2*
Total for group			**4**
Elective course grouped in 0309 - Must obtained 12 credits			
1	*211224*	Proteomics	*2*
2	*211318*	Writing a Scientific paper	*2*
3	*211905*	Genomic	*2*
4	*211904*	Minor Thesis	*6*
5	*211915*	Thesis	*12*
Total for group			**24**

Total credits of compulsory courses: 123 Total credits of elective courses : 35

4.5.2. Biotechnology program

4.5.2 Biotechnology program

No	Subject code	Name of courses	Credit number
1. General courses			
Compulsory courses			
1	*200101*	Philosophy of Marxism and Leninism	*3*
2	*202113*	Advanced Mathematics B2	*2*
3	*202201*	General Physics 1	*2*
4	*202301*	General Chemistry	*3*
5	*202304*	General Chemistry Laboratory	*1*
6	*202401*	General Biology	*2*
7	*202402*	General Biology Laboratory	*1*
8	*202501*	Physical Education 1	*1*
9	*202622*	General Law	*2*
10	*213603*	English 1	*4*
11	*200102*	Political Economics of Marxism and Leninism	*2*
12	*200201*	Military training (theory)	*3*
13	*200202*	Military training (practice)	*3*
14	*202121*	Probability and Statistics	*3*
15	*202502*	Physical Education 2	*1*
16	*211107*	Introduction of Biotechnology	*2*
17	*213604*	English 2	*3*
18	*214103*	General Informatics	*3*
19	*200103*	Scientific Socialism	*2*
20	*200107*	Ho Chi Minh Ideology	*2*
21	*211501*	Introduction to pharmaceutical biology	*2*
22	*200105*	History of Vietnamese Communist Party	*2*
Total			***49***
2. Fundamental courses			
Compulsory courses			
1	*211123*	English for Biotechnology 1	*1*
2	*211140*	Essential Skills in University Research and	*2*

		Education	
3	*211141*	Biological Laboratory Safety Management	*2*
4	*211124*	English for Biotechnology 2	*1*
5	*211138*	Microbial Biology	*2*
6	*211139*	Experiment in Microbial Biology	*1*
7	*211106*	Molecular Biology	*4*
8	*211111*	Fermentation Technology I	*3*
9	*211113*	Genetics Engineering I	*3*
10	*211402*	Biotechnological Equipment and Techniques	*3*
11	*211906*	Research Methodology	*3*
12	*211134*	Biodiversity and Conservation of Genetic Resourses	*2*
13	*211910*	Bioproduct Business	*2*
14	*211325*	Applied Biochemistry	*2*
15	*211326*	Laboratory Practice in Applied Biochemistry	*1*
16	*211110*	Biological Proteins	*2*
17	*211117*	Bioinformatics	*2*
18	*211412*	Ecology	*2*
19	*211430*	Soil and Soil Degradation	*2*
20	*211215*	Molecular Genetics	*3*
21	*211218*	Basic immunology	*3*
Total			***46***
Elective course grouped in 0201 - Must obtained 1 credit			
1	*211912*	Practice in Laboratory Research Methods	*1*
2	*211913*	Practice in Farming Research Methods	*1*
3	*211914*	Practice in Field Research Methods	*1*
Total			***3***
3. Specialized courses			
Compulsory courses			
1	*211216*	Plant Cells	*2*
2	*211217*	Animal Cells	*2*
3	*211219*	Microbiological Testing	*1*
4	*211220*	Laboratory Practice in Microbiological Testing	*2*
5	*211101*	Quality Management System	*2*

6	*211204*	Fermentation Technology II	*2*
7	*211911*	Digital Application in biological research	*2*
8	*211114*	Genetics Engineering II	*2*
9	*211309*	Enzyme Production Technology	*2*
10	*211507*	Stem Cell	*2*
11	*211909*	Bioproduct Development	*2*
12	*211916*	Internships	*2*
13	*211317*	Vaccine and Vaccine Application	*3*
Total			***26***
Elective course grouped in 0301 - Must obtained 2 credits			
1	*211126*	English for Biotechnology	2
2	*211127*	English for Environmental Biotechnology	2
3	*211142*	English for Medicine and Pharmacy	2
4	*211143*	English for Applied Biology	2
Total for group			***8***
Elective course grouped in 0302 - Must obtained 3 credits			
1	211310	Molecular Assisted Plant Breeding	*2*
2	211327	Food Biotechnology	*1*
3	211328	Biotechnology in Edible and Medicial Mushroom Production	*2*
4	211401	Nanotechnogy Introduction	*1*
Total for group			***6***
Elective course grouped in 0303 - Must obtained 3 credits			
1	*211330*	Laboratory Practice in Animal Toxicology	*1*
2	*211331*	Laboratory Practice in Insect Pesticide Resistance	*1*
3	*211336*	Soilless Cultivation Techniques	*2*
4	*211523*	Oriental Pharmaceutical Preparation	*2*
Total for group			***6***
Elective course grouped in 0304 - Must obtained 3 credits			
1	*211304*	Waste Treatment Technology	*2*

2	*211431*	Biomass Transfer Technology	*2*
3	*211508*	Bio-fertilizer Technology	*1*
4	*211510*	Bio-pesticide Technology	*1*
Total for group			***6***
Elective course grouped in 0305 - Must obtained 4 credits			
1	*211201*	Functional Foods and Human Health	*2*
2	*211202*	Probiotic	*2*
3	*211222*	Laboratory Practice in Medical Microbiology	*1*
4	*211333*	Methods in Biochemical Testing	*1*
Total for group			***6***
Elective course grouped in 0306 - Must obtained 3 credits			
1	*211207*	Plant Cell Culture	*1*
2	*211208*	Animal Cell Culture	*1*
3	*211524*	Animal Embryo Culture	*1*
4	*211525*	In vitro Fertilization	*1*
Total for group			***4***
Elective course grouped in 0307 - Must obtained 2 credits			
1	*211332*	Advanced Realtime PCR	*1*
2	*211437*	Atomic Absorption Spectrometry	*1*
3	*211503*	Advanced Chromatography	*1*
4	*211504*	Advanced ELISA	*1*
Total for group			***4***
Elective course grouped in 0308 - Must obtained 4 credits			
1	*211125*	Molecular Diagnostics in Livestock Diseases	*2*
2	*211307*	Molecular Diagnostics in Aquatic Organism Diseases	*2*
3	*211337*	Molecular Diagnostics in Plant Diseases	*2*
4	*211338*	Molecular Diagnostics in Human Diseases	*2*
Total for group			***8***

Elective course grouped in 0309 - Must obtained 12 credits			
1	*211224*	Proteomics	*2*
2	*211318*	Writing a Scientific paper	*2*
3	*211905*	Genomic	*2*
4	*211904*	Minor Thesis	*6*
5	*211915*	Thesis	*12*
Total for group			***24***

Total credits of compulsory courses: 121 **Total credits of elective courses : 37**