

UNDERGRADUATE PROGRAMME IN BIOENGINEERING 2017

Name of the programme:	Bioengineering
Education level:	Engineer
Major:	Bioengineering
Code:	7420202
Final award:	Bachelor /Engineer in Bioengineering

*(Issued in Decision No. 201A/QĐ-DHKB-DTĐH dated December 22, 2017 by President of
Hanoi University of Science and Technology)*

EXPECTED LEARNING OUTCOMES

Graduates of Engineering degree in Bioengineering must have the following knowledge, skills and competencies:

- 1) Knowledge of a wide specialized bases for a good adaptation to jobs suitable to the specialization, focusing on the ability to apply basic and core knowledge of BE programme with industrial, environmental, medical, food biotechnological and biosafety testing orientations:
 - 1.1. The ability to apply basic mathematics and science basis to participate in designing, calculating a system, a workshop or a production process of biological products.
 - 1.1.1. An ability to apply the knowledge of mathematical analytics (derivative, differential), linear algebra.
 - 1.1.2. Mastering and applying the theory of probability and experimental planning.
 - 1.1.3. An ability to apply the basic knowledge of physics (mechanical, thermal, electrical, optical processes).

- 1.1.4. Mastering the knowledge of general chemistry, physical chemistry, organic chemistry, analytical chemistry.
- 1.1.5. An ability to apply the basic knowledge of general computing.
- 1.1.6. Understanding and awareness of the basic principles of Marxism-Leninism, Revolutionary Way of the Communist Party of Vietnam, Ho Chi Minh's Thought.
- 1.2. The ability to apply basic knowledge of the industry serves as a foundation for research and solving technical problems in the industry.
 - 1.2.1. Being able to apply basic knowledge about Electrotechniques, Descriptive Geometry
 - 1.2.2. Mastering the principles and application of mechanical processes and equipment, process and equipment for heat - mass transfer processes (Process and Equipment in Biotechnology I, II and III) to be applied in solving technical problems in the industry.
 - 1.2.3. An ability to apply biotechnological processes and control techniques.
 - 1.2.4. Mastering and applying quality management knowledge in biotechnology.
- 1.3. The ability to apply the core knowledge of the discipline combining practice and internship, while using the knowledge of quality management systems and good production practices, to participate in realizing and identifying problems related to technology, equipment and quality in producing biological products.
 - 1.3.1. Mastering and applying the knowledge of Biochemistry, Microbiology, Cell Biology, Genetics and Molecular Biology, Genetic Engineering, Immunology, Bioinformatics as the foundation for researching and solving technical problems
 - 1.3.2. An ability to apply the knowledge of bioinformatics, analytical methods in biotechnology
 - 1.3.3. An ability to apply the knowledge of one of the specialized technological orientations: i) Environmental Biotechnology (including Biological Engineering for Waste Treatment , environmental toxicology, Environmental Microbiology, Environmental Management); ii) Food Biotechnology (including Fermentation engineering, Molecular and Immunological Methods in Food Industry , Food Microbiology, Enzyme in Food Technology); iii) Industrial Biotechnology (including Fermentation Engineering, Downstream processing , Industrial Microbiology

Enzymology); and iv) Molecular Biological and Cell Engineering (including Animal cell technology, Molecular Diagnostics , Techniques of Virus Cultivation , Recombinant DNA Technology).

1.3.4. Being able to master and apply other selective technology knowledge such as: Techniques for Obtaining Bioactive Compounds from Plant , Plant Cell and Tissue Culture Technology , Genetically Modified Organism and Application .

1.3.5. Being able to carry out experiments on one of the following technologies: Biological waste treatment techniques, Fermentation techniques, Recombinant DNA techniques, Techniques of Animal cell culture, Enzyme technology, Techniques for obtaining bioactive substances from plants.

1.3.6. Having the knowledge of quality management systems in biotechnology and good manufacturing practices (GMP).

1.4. The ability to participate in production organization, design and evaluation of technological solutions, equipment and quality of biological products.

1.4.1. Being able to apply the basic knowledge for project planning and design of biological product manufacturing plants or facilities: Project establishment and plant design, Occupational safety and Industrial sanitation, Industrial construction.

1.4.2. Mastering and applying specialized technology knowledge on one of the orientations i) Environmental Biotechnology (including: Biological engineering of solid waste treatment, Biological engineering of waste water treatment, Technology of biological preparations for environmental protection); ii) Food Biotechnology (including: Fermented and beverage production technology, Food quality management and assurance system); iii) Industrial Biotechnology (including: Technology of Microbial preparations, Amino Acid Technology, Enzyme Technology) and iv) Molecular biological and cell engineering (including: Vaccine Technology, Technology for manufacturing diagnostic biological products, Bio-nanomaterials, Recombinant protein technology).

1.4.3. Being able to perform specialized experiments on one of the following areas: Environmental Biotechnology, Food Biotechnology, Industrial Biotechnology, Molecular biological and cell Engineering.

- 1.4.4. In addition, students can master and apply the knowledge of other selective specialized technologies such as: Plant protection biotechnology, Microbial fertilizer technology, Fermentation technology of antibiotic compounds, Technology of organic solvents and acid production
 - 1.4.5. Having a specialized elective knowledge related to production such as: Optimizing industrial biotechnology, Automatic control in biotechnology, Corporate governance, Food inspection.
- 2) Professional skills, personal skills and qualities to be able to learn at a higher level, the ability to learn to adapt to the continuous development of science and technology and to be able to learn lifelong practice:
- 2.1. The ability to identify technical issues in the global economic, environmental and social context.
 - 2.1.1. An ability to select information via papers, electronic and internet documents.
 - 2.1.2. An ability to identify issues related to Technology, Equipment and Quality in the production of biological products.
 - 2.2. Having an integrated analytical approach from which to formulate ideas on a project; participate in developing methods to implement the project in production, testing and services in the field of biotechnology.
 - 2.2.1. Having ability to point out problems and interactions in the technology of producing biological products.
 - 2.2.2. Being able to arrange and identify key elements in bio-product manufacturing technology
 - 2.2.3. Being able to apply skills in design in a general outline of issues related to the technology of manufacturing biological products
 - 2.3. Being proactive, willing to take risks, showing flexibility, using creative thinking and thinking, being able to self-assess knowledge, skills and attitudes, Self-learning and lifelong learning.
 - 2.3.1. Being able to demonstrate initiatives in learning and research
 - 2.3.2. Being able to express perseverance and flexibility.

- 2.3.3. Being able to apply creative thinking
- 2.3.4. An ability to use self-assess knowledge, self-study and lifelong learning.
- 2.4. An ability to manage time
- 2.5. Having professional ethics, honesty and sense of responsibility, professional behavior, proactive in planning for their own careers, selecting and regularly updating information in the field of bioengineering
 - 2.5.1. Demonstrate professional ethics, honesty, responsible work.
 - 2.5.2. Demonstrate professional behaviors.
 - 2.5.3. Being able to plan for career.
 - 2.5.4. An ability to select and update information in the field of biological engineering.
- 3) Communication skills, teamwork, international integration:
 - 3.1. Ability to actively and independently work and in team work with multidisciplinary collaboration environment.
 - 3.1.1. Can participate in setting up, implementing and developing groups.
 - 3.1.2. Having team leadership skills.
 - 3.1.3. Being able to organize technical groups and multidisciplinary teams.
 - 3.2. The ability to communicate with domestic and foreign partners.
 - 3.2.1. Participate in the choice of communication methods with partners
 - 3.2.2. Good understanding and application of written communication.
 - 3.2.3. An ability to communicate in multimedia.
 - 3.2.4. An ability to present ideas through graphic methods.
 - 3.2.5. An ability to present effectively.
 - 3.3. Having skills in using English effectively in specialized work and communicating, with TOEIC score of 500 or higher.
 - 3.3.1. Obtaining English level of learning outcomes (TOEIC 500 or above)
 - 3.3.2. An ability to understand specialized documents.
- 4) The Ability to create ideas, design, implement and operate in the corporate and social context:

- 4.1. Recognition of the role and responsibility of the engineer for the society, being aware of the impact of technical application on society, knowledge of state laws and regulations on the technical field, receiving be aware of historical and cultural contexts, be aware of topical issues and global development prospects
 - 4.1.1. An strong recognition of the roles and responsibilities of engineers for the society.
 - 4.1.2. Understanding the benefits brought about in the application of science and technology.
 - 4.1.3. Having the knowledge of the state regulations on biotechnology.
 - 4.1.4. Having legal knowledge, history and culture.
 - 4.1.5. Being able to analyze biotechnology development orientation in the world and Vietnam.
- 4.2. Adhering to the diversity of corporate culture, mastering the business strategy, objectives and business plans, having the idea of technical commercialization, being able to adapt in different working environments.
 - 4.2.1. Having the diversity of corporate culture.
 - 4.2.2. Understanding the orientation of developing biotechnology fields.
 - 4.2.3. Being able to participate in commercialization of technology products.
 - 4.2.4. Being able to adapt in different working environments.
- 4.3 Ability to participate in building ideas on a research project; participating in the project implementation plan; applying knowledge and making design plans; participate in practical design.
 - 4.3.1 An ability to plan on a project in biotechnology production, testing and services.
 - 4.3.2 An ability to apply the knowledge related to standards in producing and testing biological products.
 - 4.3.3 An ability to master processes related to biological product manufacturing
 - 4.3.4 An ability to apply the knowledge and making plans in design.
 - 4.3.5 An ability to practice in designing a system, a workshop or a production process of biological products / biotechnology applications

5) Political quality, awareness of serving people, having health, meeting the requirements of national construction and protection:

5.1 Sufficient level of political theory according to the general programme of the Ministry of Education and Training.

5.2 A Certificate of Physical Education and a Certificate of Defence Education in accordance with general rules of the Ministry of Education and Training