

BACHELOR OF SCIENCE IN BIOTECHNOLOGY

COURSE SPECIFICATION

SH03006: ANIMAL CELL TECHNOLOGY

I. Information about the course

- Course code: SH03006
- Semester: 07
- Number of credits: 3 (3-0-9)
- Credit hours for learning activities
 - + Theoretical lessons in the class: 30 periods
 - + Project based-learning: 15 periods
- Self-studying: 135 periods (according to individual plans, and based on the lecturer's instructions)
- Units in charge:
 - Department: Animal Biotechnology
 - Faculty: Biotechnology
- The course belongs to the following knowledge group:

General knowledge <input type="checkbox"/>		Foundation knowledge <input type="checkbox"/>		Specialized knowledge <input checked="" type="checkbox"/>	
Compulsory <input type="checkbox"/>	Elective <input type="checkbox"/>	Compulsory <input type="checkbox"/>	Elective <input type="checkbox"/>	Compulsory <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>

- Prerequisite course: Human and Animal Biology (SH02002)
- Language used for teaching: Vietnamese

II. Course objectives and course expected learning outcome

*** The objectives of the course:**

The course aims to provide students with the following knowledge:

+ Scientific basis, development and new achievements in the field of animal cell technology, including:

- ✓ Background and achievements of animal cell technology;
- ✓ Organization of an animal biotechnology laboratory;
- ✓ Animal cell culture techniques;
- ✓ Techniques for culturing animal cells on 3-D substrates and other culture systems;
- ✓ Related techniques in animal cell culture;
- ✓ Application of animal cell technology.

The course aims to provide students with the following skills:

+ Apply creative critical thinking in collecting, analyzing, evaluating, selecting and synthesizing specialized documents.

+ Working and reporting project.

The course helps students develop the following qualities:

+ Active and creative; eager to learn; conscious accumulation of knowledge and lifelong self-learning.

*** The Expected Learning Outcomes for the Bachelor of Biotechnology program**

Expected learning outcomes (ELOs) of the Bachelor of Science in Biotechnology program Upon graduation, graduates would be able to:	Cognitive level
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Expected learning outcomes (ELOs) of the Bachelor of Science in Biotechnology program		Cognitive level
Upon graduation, graduates would be able to:		
General Knowledge	ELO1: Apply knowledge of mathematics, social sciences, natural sciences, laws, and contemporary issues into the field of biotechnology.	Apply
	ELO 2: Analyze the needs and requirements of stakeholders for the purposes of management, production, and sales of biotechnology products.	Analyze
Professional Knowledge	ELO3: Evaluate the quality of biotechnology products with regard to biosafety standards, environmental protection, legal, and ethical standards.	Evaluate
	ELO4: Develop ideas for biotechnology products based on personal knowledge of natural sciences, life sciences, and analysis of social needs.	Create
	ELO5: Design production models for biotechnology products	Create
General Skills	ELO6: Apply critical and creative thinking skills to effectively solve issues related to research, technology transfer, and production in the field of biotechnology.	Adaptation
	ELO7: Coordinate with team members to achieve set goals, either as a team member or team leader.	Origination
	ELO8: Communicate effectively through various channels in the diverse contexts of the workplace; satisfy English proficiency levels as required by the Ministry of Education and Training.	Origination
Professional Skills	ELO9: Utilize information technology and equipment effectively for management, production, and sales in the field of biotechnology.	Adaptation
	ELO10: Use appropriate methods and skills to collect, analyze, interpret data in scientific research, and examine practical issues at the workplace.	Adaptation
	ELO11: Perform basic and intensive technical procedures fluently in the field of biotechnology	Adaptation
	ELO12: Advise customers and partners on biotechnology products with a positive business perspective.	Adaptation
Attitude	ELO13: Comply with the laws of the biotechnology industry, and conform to occupational safety principles at the workplace.	Valuing
	ELO14: Maintain professional ethics, fulfill one's duty to improve the well-being of the society, and protect the environment.	Valuing
	ELO15: Perform the habits of updating knowledge and experiences to improve one's professional qualifications	Characterizing

*** Course expected learning outcomes (CELOs):**

The course contributes to the expected learning outcomes of the program at the following levels: *I - Introduction*); *P -Practice*; *R - Reinforce*; *M –Master*

Course code	Course name	Contribution level towards the expected learning outcomes of the program							
		ELO1	ELO2	ELO3	ELO4	ELO5	ELO6	ELO7	ELO8
SH03006	Animal Cell Technology								
					M		M		
		ELO9	ELO10	ELO11	ELO12	ELO13	ELO14	ELO15	
			R					R	

Code	Course expected learning outcomes Upon completion of this course, students are able to:	ELOs of the program
Knowledge		
CELO1	Develop ideas for biotechnology products based on knowledge of natural sciences, life sciences and analysis of social needs. Analysis of foundational technologies and achievements in the field of cellular technology; Laboratory organization, major and related techniques in cell culture and applications of animal cell technology.	ELO4
Skills		
CELO2	Apply critical and creative thinking to effectively solve research, technology transfer and production problems in the biotechnology industry.	ELO6
CELO3	Apply methods and skills to collect, analyze and process information in scientific research and investigate problems of professional practice.	ELO10
Attitude		
CELO4	Make a habit of updating knowledge and experience to improve your professional level.	ELO15

III. Summary of course content

SH03006. Animal Cell Technology: 3 credits (3–0–9).

Chapter 1: Scientific background and some typical achievements of animal cell technology;

Chapter 2: Organization of animal biotechnology laboratories;

Chapter 3: Animal cell culture techniques;

Chapter 4: Animal cell culture techniques on 3-dimensional substrates and other culture systems;

Chapter 5: Related techniques in animal cell culture;

Chapter 6: Applications of animal cell technology.

Project

IV. Teaching and learning methods

1. Teaching methods

- ✓ Lecturing method
- ✓ Teaching with videos
- ✓ Teaching through project
- ✓ Online-Teaching MSTeams-Vnua

2. Learning methods

- ✓ Listen to lectures in class
- ✓ Join the project team
- ✓ Online learning (E-learning) MSTeams-Vnua

V. Requirements for students

- Attend class (classroom class or online class-MSTeams-Vnua): Students must attend the class fully according to the regulations of the University, participate in expressing opinions, discussing and developing articles.

- Preparing for the lecture: Students attending this module are required to read the lecture and reference materials before learning related content.

- 15-minute exercises and tests (if any): Students must complete the exercises and tests in 15 minutes.

- Essays (if any): Students must fully prepare essays, participate in discussions and pass tests.

- Implementation of Project (Project based-learning): Students must perform and report satisfactory results.

- Must take the midterm exam, the final exam and must pass the requirements.

- For online learning: students need to install learning software and fulfill the teacher's requirements for online learning.

VI. Scoring and assessment

1. Scale: 10

2. The average score of the course is score of each rubric multiplying with the corresponding weight of each rubric

- ✓ Rubric 1 - Attendance: 10%
- ✓ Table 1 - Mid-term exam score: 15%
- ✓ Rubric 2 - Project score: 15%
- ✓ Table 2 - Final exam score: 60%

3. Assessment methods

The criteria, rubrics, and assessment methods	CELOs to be assessed	Percentage (%)	Time / Studying week
Progress assessment		40	
Attendance (Rubric 1)	K1, K2, K3, K4	10	Week 1 to week 13
Mid-term exams (Table 1)	K1	15	Week 7 or week 8
Project based-learning (Rubric 2)	K1	15	Week 13 to week 15
End-of-course assessment		60	
Final exam (Table 2)	K1	60	At least 2 weeks after the end of the course

Rubic 1: Attendance class

Criteria	Percentage	Excellent 8.5 - 10 points (A)	Good 6.5 - 8.4 points (C+, B, B+)	Average 4.0 – 6.4 points (D, D+, C)	Poor 0 – 3.9 points (F)
Participation time	50%	Participation ≥ 19 periods (4.5 -5.0đ)	Participation 14-18 periods (3.5 - 4.0đ)	Participation 9-13 periods (2.0 - 3.0đ)	Participation <9 periods (0 - 1.5đ)
Participation attitude	50%	Actively participate (4.5 - 5.0đ)	Not really actively participate (3.5 - 4.0đ)	Occasionally participate (2.0 - 3.0đ)	Rarely participate (0- 1.5đ)

Table 1: Criteria and contents for assessment of mid-term exams
(Maximum score of 10/10)

CELOs that are assessed through the exam	Exam content	Performance indicator (Students are required to perform and be evaluated based on these indicators)

K1 Apply basic knowledge to the analysis of problems in the field of animal cell technology	Chapter 1: Scientific background, some typical achievements of animal cell technology	Indicator 1: Present and analyze the scientific foundation of animal cell technology
	Chapter 2: Organization of an animal biotechnology laboratory	Indicator 2: Present, analyze the organization of animal biotechnology laboratory
	Chapter 3: Animal cell culture techniques	Indicator 3: Present and analyze animal cell culture techniques
	Chapter 4: Animal cell culture techniques on 3-dimensional substrates and other culture systems	Indicator 4: Present and analyze techniques for culturing animal cells on 3-D substrates and other culture systems

The form of essay or multiple choice exam, thematic; online or at the exam room according to the regulations of the University.

Rubric 2: PROJECT assessment (Maximum score of 10/10)

Criteria		Percentage %	Excellent 8.5 – 10 points	Good 6.5 – 8.4 points	Average 4.0 – 6.4 points	Poor 0 – 3.9 points
Participation Attitude	Give ideas	15	Actively looking for and proactively coming up with new ideas	Search and come up with pretty good ideas	Choose an idea from the suggestions	Don't care about choosing ideas
	Make an implementation plan	15	Perfectly reasonable, no adjustments needed	Quite reasonable, slightly adjusted according to the comments	Not reasonable, adjusted according to comments	Not reasonable and not adjusted according to comments
Implementation process	Preparation phase	10	Prepare well all conditions for project implementation, can start immediately	Most of the conditions are ready for implementation, can be started and added later	Some conditions have been prepared for the implementation, but need to add more to be able to start	No conditions were prepared
	Implementation phase	10	Follow the correct method	Implemented quite properly, with small errors and corrections	Relatively correct method, important errors and corrections	Implement improper methods, errors cannot be corrected

		10	Executing the right plan	Deployed quite according to the plan, there was a delay but no impact	Deployment is relatively on schedule, there is a delay that affects but can be overcome	Deployment is delayed, causing irreparable impact
Report	Content	10	Precise, scientific	Quite accurate, scientific, there are a few small errors	Relatively accurate, scientific, with important errors	Inaccuracy, science, many important errors
	Presentation	10	Lead the issue and argue attractively, persuasively	The presentation is clear but not attractive, the argument is quite convincing	Difficult to follow but still able to understand important content	The presentation is not clear, the audience cannot understand the important content
	Answer	10	Correctly asked questions are answered fully, clearly, and satisfactorily	Answer most of the questions correctly and give appropriate directions for unanswered questions	Answered most of the questions correctly, but did not give appropriate orientation for unanswered questions	Unable to answer most questions correctly
	Product	10	Excellent	Good	Average	Poor

Table 2: Criteria and contents for assessment of final exams
(Maximum score of 10/10)

CELOs that are assessed through the exam	Exam content	Performance indicator (Students are required to perform and be evaluated based on these indicators)
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K1 Apply basic knowledge to the analysis of problems in the field of animal cell technology	Chapter 1: Scientific background, some typical achievements of animal cell technology	Indicator 1: Present and analyze the scientific foundation of animal cell technology
	Chapter 2: Organization of an animal biotechnology laboratory	Indicator 2: Present, analyze the organization of animal biotechnology laboratory
	Chapter 3: Animal cell culture techniques	Indicator 3: Present and analyze animal cell culture techniques
	Chapter 4: Animal cell culture techniques on 3-dimensional substrates and other culture systems	Indicator 4: Present and analyze techniques for culturing animal cells on 3-D substrates and other culture systems
	Chapter 5: Related techniques in animal cell culture	Indicator 5: Present and analyze related techniques in animal cell culture
	Chapter 6: Applications of animal cell technology	Indicator 6: Present and analyze the application of animal cell technology

The form of essay or multiple choice exam, thematic; online or at the exam room according to the regulations of the University.

4. Requirements of the course

- ✓ Late submission: Late submission of assignments, discussions, and essays will result in a 50% deduction of marks.
- ✓ Taking exams: Failure to participate in any test will result in a score of 0 for that test.
- ✓ Ethical requirements: According to the requirements of the Vietnam National University of Agriculture.

VII. Textbook / reference materials

*** Textbook /Lectures:**

1. Vo Thi Thuong Lan (2017). Textbook of Cellular and Applied Molecular Biology. Vietnam Education Publishing House.
2. Nguyen Van Thanh, Tran Tien Dung, Su Thanh Long, Nguyen Thi Mai Tho, Nguyen Cong Toan, Hoang Kim Giao (2017). Textbook of Animal Reproduction Technology. Agricultural University Publishing House.

*** Reference materials:**

1. Nguyen Thi Thuong, Nguyen Tien Dat, Nguyen Van Hanh, Nguyen Huu Duc and Nguyen Viet Linh (2018). Effects of Caffeine on In vitro Fertilization of Pig Follicular Oocytes. Vietnam Journal of Agricultural Sciences, 1(2): 182-186.
2. Nguyen Van Hanh, Vi Dai Lam, Nguyen Huu Duc, Do Trung Kien, Nguyen Viet Linh (2015). Study on the effects of DMSO in the differentiation of hepatocyte-like cells from umbilical cord stem cells. Journal of Biotechnology 37(1se): 190-195.
3. Bui Ha My, Nguyen Thi Huong, Nguyen Huu Duc, Tran Thi Thuy Ha (2018). Study of genetic diversity of the spotted pompano (*Hemibagrus guttatus* Lacepede, 1803) using microsatellite markers. Journal of Biotechnology, 16(1): 59-65.

*** Online references:**

Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, Sixth Edition.

<https://onlinelibrary.wiley.com/doi/book/10.1002/9780470649367>

VIII. Teaching plan

Week	Content	CELOs
	Chapter 1: Scientific background, some typical achievements of animal cell technology	K1, K2, K3, K4
	A/ Main content in class: (02 periods) Theoretical content: 1.1. General concept 1.2. Scientific and technical background 1.3. Some typical achievements	
	B/ Contents to be self-study at home: (06 periods) Read the syllabus, lectures and find out information related to the content of the chapter.	
	Chapter 2: Organization of an animal biotechnology laboratory	K1, K2, K3, K4
	A/ Summary of the main content in class: (08 periods) Theoretical content: 2.1. General introduction 2.1.1. Development history 2.1.2. Features of animal cells 2.1.3. Cell line concept 2.1.4. Animal cell and tissue cultures 2.2. Laboratory 2.2.1. Laboratory design 2.2.2. Equipment 2.2.3. Culture tools 2.2.4. Physical and chemical conditions in cell culture techniques 2.2.5. Animal cell culture medium	
	B/ The contents to be self-study at home: (24 periods) Read the syllabus, lectures and find out information related to the content of the chapter.	
	Chapter 3: Animal cell culture techniques	K1, K2, K3, K4
	A/ Summary of the main content in class: (08 periods) Theoretical content: 3.1. Primary culture 3.1.1. Sample collection and preliminary treatment 3.1.2. Separate cells 3.1.3. Cell acquisition culture 3.2. Secondary culture 3.2.1. Cell line selection technique 3.2.2. Methods of creating cell lines 3.2.3. Growth curve and development 3.2.4. Test to find the limit point 3.2.5. Effective spread Hiệu 3.3. Serum-free culture	
	B/ Contents to be self-study at home: (24 periods) Read the syllabus, lectures and find out information related to the content of the chapter.	
	Chapter 4: Animal cell culture techniques on 3-dimensional substrates and other culture systems	K1, K2, K3, K4
	A/ Summary of the main content in class: (04 periods) Theoretical content: 4.1. Limitations of the traditional method	

Week	Content	CELOs
	4.2. 3D . cell culture system 4.2.1. Ideal characteristics of Scaffold 4.2.2. Scaffold materials 4.2.3. Traditional Scaffold Manufacturing Methods 4.2.4. The limitations of the tissue engineering Scaffold 4.2.5. Solid free-form fabrication (SFF) engineering 4.2.6. SFF in tissue engineering 4.2.7. Using a solid free-form fabrication mold to structure Scaffold 4.3. Applications of 3D . cell culture technique 4.3.1. Bone tissue and cell engineering 4.3.2. Cell culture on Scaffold to create heart valves 4.4. Other culture systems 4.4.1. Culture of animal cells in a stirrer 4.4.2. Animal cell culture at pilot scale and production	
	B/ Contents to be self-study at home: (12 periods) Read the syllabus, lectures and find out information related to the content of the chapter.	
	<i>Chapter 5: Related techniques in animal cell culture</i>	K1, K2, K3, K4
	A/ Summary of the main content in class: (04 periods) Theoretical content: 5.1. Aseptic technique K ₁ 5.2. Cell observation 5.2.1. Direct observation on the culture plate 5.2.2. Observe under the microscope 5.3. Cell sample infection control 5.3.1. Infection detection 5.3.2. Prevent infection 5.3.3. Eliminate contamination in culture 5.4. Freezing technique 5.4.1. Cell preservation 5.4.2. Cell activation 5.4.3. Basic freezing process	
	B/ Contents to be self-study at home: (12 periods) Read the syllabus, lectures and find out information related to the content of the chapter.	
	<i>Chapter 6: Applications of animal cell technology</i>	K1, K2, K3, K4
	A/ Summary of the main content in class: (04 periods) Theoretical content: 6.1. Some applications of animal cell culture techniques 6.1.1. Model of testing and diagnosis of disease 6.1.2. Production of biological compounds 6.1.3. Animal cells as transplant material 6.1.4. Creating organs from cultured animal cells 6.1.5. Production of insecticidal viruses 6.2. Some applications of animal cell technology in animal husbandry 6.2.1. Applications in livestock-poultry farming 6.2.2. Applications in aquaculture 6.2.3. Application in animal husbandry and the issue of livestock breed conservation	

Week	Content	CELOs
	B/ Contents that need to be studied at home: (12 periods) Read the syllabus, lectures and find out information related to the content of the chapter.	
12-15	<p>Teaching-learning through Project implementation (Project-based learning)</p> <p>I. Subject name: Animal cell technology</p> <p>II. Project and product name</p> <ol style="list-style-type: none"> 1. Project name: Topics in the field of cell technology, human and animal reproductive technology 2. Product: After 2-3 weeks, the implementation team presents the results of the project implementation related to the assigned topic. <p>III. Expected learning outcomes (knowledge, skills, attitudes):</p> <ol style="list-style-type: none"> 1. Equip students with knowledge: <ul style="list-style-type: none"> - Cell technology, reproductive technology in humans and animals; - Factors affecting technology; - Efficiency and applicability of technologies. 2. Skills: <ul style="list-style-type: none"> - Collect specialized information and documents; - Processing, selecting and translating documents; - Working group; - Design presentations, print reports; - Presentation. 3. Attitude: <ul style="list-style-type: none"> - Serious preparation; - Expediently complete the task; - Overcoming difficulties, solidarity, criticism; - Create products with the highest love of the profession and responsibility, the best quality in the ability of students. <p>IV. Project organization:</p> <ol style="list-style-type: none"> 1. Subjects of students: Students in the 3-4th year 2. Number of students per group: 6-8 students/group. 3. Project implementation time: 2-3 weeks 4. Project phases: <ul style="list-style-type: none"> Stage 1: Identify documents related to cell technology, human and animal reproductive technology. Stage 2: Select documents, build the main idea of the project according to the assigned or self-selected object. Stage 3: Implement, complete the project according to the selected topic. 5. Results reporting schedule: Before the end of the course. 6. Rubrics for scoring: <ul style="list-style-type: none"> - Rubric scores Project <p>V. Project:</p> <ol style="list-style-type: none"> 1. Introduce the problem: <ul style="list-style-type: none"> - Identify the target audience, objectives and review domestic and foreign documents related to cell technology, human and animal reproductive technology. 2. Basic requirements for product quality and quantity: <ul style="list-style-type: none"> - Number of products: each group after 2-3 weeks will have 01 PPT report presented in class. - Quality: Beautifully printed report, full of learning content, 	K1, K2, K3, K4

Week	Content	CELOs
	<p>including attached references.</p> <p>3. Description of project phases:</p> <p>Stage 1: Identify topics, gather documents related to cell technology, human and animal reproductive technology.</p> <ul style="list-style-type: none"> - Outcomes that the team must achieve: Selected topic, outline PPT report and printed product. - Classroom lessons and necessary instructions: Cell technology, reproductive technology. - Knowledge and skills students learn: Cell technology, reproductive technology, teamwork skills, presentation skills. <p>Stage 2: Select documents, build the main idea of the project according to the assigned or self-selected object.</p> <ul style="list-style-type: none"> - Results that the team must achieve: Selected documents meet professional requirements. - Class lessons and necessary instructions: Presentation and analysis of cell technology, reproductive technology, some factors related to reproductive technology, efficiency of technology. - Knowledge and skills acquired by students: Cell technologies, reproductive technology, teamwork skills, presentation skills. <p>Stage 3: Implement, complete the project according to the selected topic.</p> <ul style="list-style-type: none"> - Results that the team must achieve: PPT report. - Classroom lessons and necessary instructions: Completing the PPT report. - Knowledge and skills learned by students: Cell technology and reproductive technology. Presentation skills and teamwork. <p>4. Project phase report form:</p> <ul style="list-style-type: none"> - Stage 1: Report on documents related to the topic. - Stage 2: Presentation on cell technology, reproductive technology in humans and animals. - Stage 3: Evaluate the results of the project implementation. <p>5. Product presentation:</p> <ul style="list-style-type: none"> - Report on documents related to the topic. - Presentation on cell technology, reproductive technology in humans and animals. - Evaluate project performance. 	

IX. Lecturer requirements for the course:

- Classrooms: required to have enough tables, chairs, boards, chalk, light, ventilation, and hygiene.
- Teaching facilities: projectors, speakers, internet, E-learning.
- E-learning: online teaching software (MSTeams), computers, server systems and infrastructure connecting to the Internet with bandwidth to meet user requirements, without network congestion or overload. Online classrooms are full of light, soundproof, well-ventilated, tidy, neat and clean.

X. Revisions (The course specification is revised annually according to the regulations of the University)

- 1st revision: 7/2018
- 2nd revision: 7/2019
- 3rd revision: 7/2020

Hanoi, July 29th, 2020

HEAD OF DEPARTMENT

(Name and signature)

Nguyen Huu Duc

LECTURER

(Name and signature)

Nguyen Huu Duc

DEAN

(Name and signature)

**ON BEHALF OF THE PRESIDENT
VICE PRESIDENT**

**APPENDIX
INFORMATION ABOUT LECTURERS WHO ARE TEACHING THE COURSE**

Lecturer in charge of the course

1. Full name: Nguyen Huu Duc	Title / Degree: PhD.
Workplace address: Trau Quy, Gia Lam, Hanoi	Phone no.: 0399606099
Email: nhduc@vnua.edu.vn	Website: http://www.vnua.edu.vn/khoa/cnsh/index.php/vi/
Students can contact the lecturers teaching the course through the following ways: 1. Phone calls; 2. Writing emails to the lecturers; 3. Arrange a meeting with the lecturer; 4. Meet and discuss with the instructor during office hours as provide by the instructor.	

Supporting lecturer

2. Full name: Tran Thi Binh Nguyen	Title / Degree: PhD.
Workplace address: Trau Quy, Gia Lam, Hanoi	Phone no.: 0944661010
Email: ttbnguyen@vnua.edu.vn	Website: http://www.vnua.edu.vn/khoa/cnsh/index.php/vi/
Students can contact the lecturers teaching the course through the following ways: 1. Phone calls; 2. Writing emails to the lecturers; 3. Arrange a meeting with the lecturer; 4. Meet and discuss with the instructor during office hours as provide by the instructor.	