Table 1. Programe curriculum

No.	Course code		Courses	Credits
	Letter	**Number**		
Part 1. Compulsory courses (4 credits)				
1	HPTSSH 01	01	Molecular Genetics and Genomics	2
2	HPTSSH 02	02	Biodiversity Conservation	2
Part 2. Option courses (4 credits)				
3	HPTSSH 03	03	Marine Biology	2
4	HPTSSH 04	04	Molecular Evolution	2
5	HPTSSH 05	05	Environmental Ecology	2
6	HPTSSH 06	06	Applied Plant Physiology	2
7	HPTSSH 07	07	Applied Animal Physiology	2
8	HPTSSH 08	08	Applied Microbiology	2
9	HPTSSH 09	09	Genetics and Animal Breeding	2
10	HPTSSH 10	10	Advanced Cell Technology	2
11	HPTSSH 11	11	Applied Bioinformatics	2
Part 3. Thesis				
	Literature report			2
	Special topics			6
	Thesis			74
	Total			**90**

COURSE SYLLABUS

1. MOLECULAR GENETICS AND GENOMICS

I. COURSE INFORMATION

1.1. General information

1.1.1. Course title: Molecular Genetics and Genomics

1.1.2. Course title: HPTSSH01

1.1.3. Number of credit: 2

1.1.4. Type of course:+ Required: ☒

+ Optional: ☐

1.1.5. Prerequisite codes: Genetics

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English.

1.2. The goal of course

1.2.1. Knowledge: (1) Enhance knowledge of Molecular Genetics and Genomics, (2) Analysis and application of concepts and theory on Molecular Genetics and Genomics in medical healthcare, molecular breeding and other related fields.

1.2.2. Skills: 1) Establishing molecular biodiversity and genomics projects (2) Group working, (3) Practice, research in the laboratory and field.

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

The main content of the course is to introduce students to the knowledge about:

- Basic genetics
- Molecular genetics
- Digital analysis of genomes, genomics, proteomics: modern tools for analyzing

the whole genome and their expression;

- Human genetics: How genes play a role in diseases and human health, including cancer;

- Molecular evolution;

- Molecular system.

1.4. Contents

6.1. Variation and Selection in Populations

6.2. Molecular evolution

6.3. Molecular system and medical prediction

II. LECTURER INFORMATION

1. Full name: **Nguyen Hoang Loc**

Title, degree: Prof. Dr.

Place of work: University of Sciences, Hue University

Contact address: 77 Nguyen Hue Str., Hue city

E-mail: nhloc@hueuni.edu.vn / nhlocs@gmail.com, Phone: +84-234-6505051

Main research interests:

- Heterologous enzyme production in yeast and bacteria.
- Expression of genes coding subunit antigens in plants and bacteria.
- Regulation of gene expression in the pathways of secondary metabolism in plant cells.

2. Full name: **Nguyen Thi Thu Lien**

Title, degree: Assoc. Prof. Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0936490805; Email:nttliencnsh@hueuni.edu.vn; nthuliencnsh@gmail.com

Main research interests:

- Molecular markers
- Biodiversity
- Phycology and Plant Biotechnology

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chapter 1. Genetics: The Study of	2	0	1

Biological Information			
Chapter 2. Genes	2	0	1
Chapter 3. Analyzing of genetic information	4	0	2
Chapter 4. Gene transfer in chromosome	4	1	2
Chapter 5. How Gene Regulation?	4	0	2
Chapter 6. Gene and genomics	2	1	2
Total	18	2	10

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points

- Form of presentation: 20% of total points

- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. Bowler, P. J. 1989. The Mendelian Revolution. Baltimore, MD: Johns Hopkins University Press.
2. Carlson, E. A. 1987. The Gene: A Critical History. 2d ed. Philadelphia: Saunders.
3. Judson, H. F. 1996. The Eighth Day of Creation: The Makers of the Revolution in Biology. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
4. Hartwell, L., Hood, L., Goldberg, M.L., Reynolds, A.E., Silver, L.M. &Veres, R.C. (2000). Genetics: From Genes to Genomes. McGraw-Hill Inc: New York.
5. Lewis, R. 2001. Human Genetics: Concepts and Applications. 4th ed. Dubuque, IA: McGraw-Hill.
6. Lodish H., Berk A., Zipursky S L., Matsudaira P., Baltimore D., & Darnell J. (2013). Molecular Cell Biology. New York: W. H. Freeman
7. Lewontin, R. C. 2000. It Ain't Necessarily So: The Dream of the Human Genome and Other Illusions. New York: New York Review of Books.
8. Maroni, G. 2000. Molecular and Genetic Analysis of Human Traits. Malden, MA: Blackwell.

Director	**Head of Department**	**Lecturer 1**
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Dr. Hoang Tan Quang**	**Prof. Dr. Nguyen Hoang Loc**
		Lecturer 2
		(Name and signature)
		Assoc. Prof. Dr. Nguyen Thi Thu Lien

2. BIODIVERSITY CONVERSATION

I. INFORMATION

1.1. General information

1.1.1. Course title: Biodiversity Conversation

1.1.2. Course code: HPTSSH02

1.1.3. Number of credit: 2

1.1.4. Type of course: + Required: ☒

+ Optional: ☐

1.1.5. Prerequisite codes:

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English.

1.2. The goal of course

1.2.1. Knowledge: (1) Explaining the concepts of biodiversity conservation, (2) Understand the importance of biodiversity for human welfare and economic development, (3) Analyzing the causes of biodiversity loss in the context of Vietnam and global, (4) distinguish between extinct, endangered and threatened species; (4) Analysis and application of biodiversity conservation methods.

1.2.2. Skills: (1) Developing scientific/biodiversity conservation projects (2) Group working, (3) Practice, research in the laboratory and field, (4) the media.

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

The Biodiversity Conservation module provides learners with concepts and the importance and level of biodiversity; the threat to extinction due to human activities; Approaches to the formation of new populations; approaches to setting priorities for conservation; Issues in the design of protected areas, management of protected areas as well as rehabilitation of degraded ecosystems; Provide knowledge on sustainable

development and conservation of biodiversity.

1.4. Detailed content of the course

Chapter 1. Introduction to Biodiversity Conservation

1.1. The concept.

1.2. The main level of biodiversity

1.3. Quantitative biodiversity

1.4. The richness of biodiversity in some parts of the world

1.5. Values of biodiversity

Chapter 2. Threats to Biodiversity

2.1. Extinction

2.1.1. The concept of extinction

2.1.2. Cause of extinction

2.1.3. Mass extinction

2.2. Species are prone to extinction

Chapter 3. Conservation at Population and Species Levels

3.1. The inadequacy of the small population

3.2. Meta-population

3.3. Autecology

3.4. Formation, re-establishment of new populations

3.5. Exposition conservation strategy

3.6. Species conservation levels

3.7. Conservation of species by legislation

Chapter 4. Conservation at community level

4.1. Protected areas

4.2. Set priorities for protection

4.3. Design of protected areas

4.4. Management of protected areas

4.5. Conservation of outside protected areas

4.6. Ecology restoration

Chapter 5. Conservation of biodiversity and sustainable development

5.1. Sustainable development and conservation

5.2. Traditional societies and biodiversity

5.3. International efforts in conservation and sustainable development

5.4. The role of conservation biologists

5.5. Biodiversity conservation in Vietnam

II. LECTURER INFORMATION

1. Full name: **Truong Thi Hong Hai**

Title, degree: Assoc. Prof. Dr.

Place of work: Institute of Biotechnology, Hue University

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Phone: 0234 3676505; Email: tthhai@hueuni.edu.vn

Main research interests:

- Study on genetic diversity
- Genetic mapping and QTL analysis
- Plant breeding using molecular markers
- Molecular classification and identification of species
- Study on subspecies and distribution characteristics of plants
- Adapting and mitigating climate change in crop production

2. Full name: **Nguyen Thi Thu Lien**

Title, degree: Assoc. Prof. Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0936490805; Email: nttliencnsh@hueuni.edu.vn; nthuliencnsh@gmail.com

Main research interests:

- Molecular markers
- Biodiversity
- Phycology and Plant Biotechnology

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chapter 1. Introduction to Biodiversity Conservation	2	0	0
Chapter 2. Threats to Biodiversity	5	1	1
Chapter 3. Conservation at Population and Species Levels	5	1	1
Chapter 4. Conservation at community level	5	1	1
Chapter 5. Conservation of biodiversity and sustainable development	5	1	1
Total	22	4	4

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points
- Form of presentation: 20% of total points
- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. Lê Trọng Cúc, 2002.Đa dạng sinh học và bảo tồn thiên nhiên. Nhà Xuất bản Đại học Quốc gia Hà Nội.

2. Peter J. Bryant, 2001. Biodiversity and Conservation. University of California, USA.

3. USAID, 2005. Biodiversity Conservation: A Guide For USAID Staff and Partners

4. Michael J. Jeffries, 1997. Biodiversity and Conservation. Routledge, London

Director	**Head of Department**	**Lecturer 1**
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Dr. Hoang Tan Quang**	**Assoc. Prof. Dr. Truong Thi Hong Hai**
		Lecturer 2
		(Name and signature)
		Assoc. Prof. Dr. Nguyen Thi Thu Lien

3. MARINE BIOLOGY

I. COURSE INFORMATION

1.1. General information

1.1.1. Course title: **Marine Biology**

1.1.2. Course title: HPTSSH03

1.1.3. Number of credit: 2

1.1.4. Type of course: + Required: ☐

+ Optional: ☒

1.1.5. Prerequisite codes: Genetics, Biochemistry, physiology, and ecology.

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English.

1.2. The goal of course

1.2.1. Knowledge: (1) Enhance knowledge of Marine Biology, (2) Analysis and application of concepts and theory on Marine Biology in medical healthcare, molecular breeding and other related fields.

1.2.2. Skills: 1) Establishing Marine Biology projects (2) Group working, (3) Practice, research in the laboratory and field.

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

Marine biotechnology is concerned with the study of biochemical materials and processes from marine sources, that play a vital role in the isolation of novel drugs, and to bring them to industrial and pharmaceutical development. Today, a multitude of bioprocess techniques is employed to isolate and produce marine natural compounds, novel biomaterials, or proteins and enzymes from marine organisms, and to bring them to applications as pharmaceuticals, cosmeceuticals or nutraceuticals, or for the production of

bioenergy from marine sources. All these topics are addressed by the course of Marine Biology.

1.4. Contents

Chapter 1. Introduction to marine biology

Chapter 2. Marine flora and fauna

Chapter 3. Tools and methods in marine biology and biotechnology

Chapter 4. Marine microbiology

Chapter 5. Bioenergy and biofuels

Chapter 6. Marine bio-products in industrial applications

Chapter 7. Marine bio-products in medical and pharmaceutical applications

II. LECTURER INFORMATION

1. Full name: **Nguyen Thi Thu Lien**

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Main research interests:

- Molecular markers
- Biodiversity
- Phycology and Plant Biotechnology

2. Full name: **Le Cong Tuan**

Title, degree: Dr.

Place of work: College of Sciences, Hue University

Contact address: College of Sciences, Hue University

Phone: 0914002111; Email: tuannhi5@gmail.com

Main research interests:

- Biotechnology, applied environmental in aquaculture and water treatment;

- Biodiversity and bio-conservation aqua animals;
- Environmental capacity for planning and developing aquaculture;
- Planning and management coastal.

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion , practice
Chapter 1. Introduction to marine biotechnology	2	0	1
Chapter 2. Marine flora and fauna	2	0	1
Chapter 3. Tools and methods in marine biology and biotechnology	4	0	2
Chapter 4. Marine microbiology	4	1	2
Chapter 5. Bioenergy and biofuels	2	0	2
Chapter 6. Marine bio-products in industrial applications	2	1	1
Chapter 7. Marine bi-oproducts in medical and pharmaceutical applications	2	0	1
Total	18	2	10

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points

- Form of presentation: 20% of total points

- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. D. Regan: Marine biotechnology and the use of arid zones, Search 11, 377–381 (1980)
2. M.A. Borowitzka: Commercial production of microalgae: Ponds, tanks, and fermenters, Prog. Ind. Microbiol. 35, 313–321 (1999)
3. P. Spolaore, C. Joannis-Cassan, E. Duran, A. Isambert: Commercial applications of microalgae, J. Biosci. Bioeng. 101, 87–96 (2006)
4. J.J. Milledge: Commercial application of microalgae other than as biofuels: A brief review, Rev. Environ. Sci. Bio/Technology 10, 31–41 (2011)

Director	**Head of Department**	**Lecturer 1**
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong	**Assoc. Prof. Dr. Nguyen**	**Assoc. Prof. Dr. Nguyen**

Thi Hong Hai	**Thi Thu Lien**	**Thi Thu Lien**
		Lecturer 2
		(Name and signature)
		Dr. Le Cong Tuan

6. APPLIED ANIMAL PHYSIOLOGY

I. INFORMATION

1.1. General information

1.1.1. Course title: **Applied Animal Physiology**

1.1.2. Course code: HPTSSH06

1.1.3. Number of credit: 2

1.1.4. Type of course: + Required: ☐

+ Optional: ☒

1.1.5. Prerequisite codes: Cell Biology, immunology, molecular biology, animal physiology

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English.

1.2. The goals of course

1.2.1. Knowledge: (1) Understanding structure of the cells and tissues of animal, (2) animal cells culture (3) stem cells technology and tissue animal cloning, (4) Biotechnology in animal husbandry and veterinary (5) Ethical issues in applied biotechnology for human and animal.

1.2.2. Skills: (1) Searching and reviewing international and domestic literatures (2) Group working, (3) Analytical, identification and generation research fields.

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

The course provides advanced knowledge of animal biotechnology, especially modern biotechnology for animal including: embryo transfer technology, animal cloning technology, gene transformation and application of animal cells technology, stem cells, new generation vaccines, monoclonal antibodies.

1.4. Detailed content of the course

Chapter 1: Animal cells and tissues

1.1. Structure and function of animal cells

1.2. Structure and function of animal tissues

Chapter 2: Animal cells culture

2.1. History of animal cell culture

2.2. Design of animal cells culture laboratory

2.3. Basic medium in animal cell culture

2.4. Cells culture technology

2.5. Animal cells culture systems

2.6. Application of animal cells culture technology

Chapter 3: Cloning technology

3.1. Introduction

3.2. Summary of *in vitro* animal cloning

3.3. Biology processes of cloning technology

3.4. Basic techniques in *in vitro* cloning

3.5. Application of animal cloning

Chapter 4: Stem cells

4.1. Introduction

4.2. Embryonic stem cells

4.3. Adult stem cells

Chapter 5: Genetic modification animals

5.1. Introduction

5.2. Methods for animals genetic modification

5.3. Gene-Targeting

5.4. Application of genetic modified animals in medicine

Chapter 6: Biotechnology in animal husbandry

6.1. Introduction

6.2. Biotechnology in livestock and poultry

6.3. Biotechnology in aquaculture

6.4. Conservation of livestock breeding

II. LECTURER INFORMATION

1. Full name: **Assoc. Prof. Nguyen Quang Linh**

Place of work: Institute of Biotechnology, Hue University

Contact address: Hue University

Phone: 0914007474, Email:nguyenquanglinh@hueuni.edu.vn.

2. Full name: **Huynh Van Chuong**

Title, degree: Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 01698951050; Email: chuonghv81@yahoo.com

Main research interests:

- Applied biotechnology in animal husbandry and veterinary
- Diagnosis and prevention of animal diseases
- The spread of diseases between human and animal
- Application vaccine, antibody and medicinal plants for prevention and treatment animal diseases

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chapter 1. Animal cells and tissues	2	0	1
Chapter 2. Animal cells culture	4	1	1
Chapter 3. Cloning technology	4	1	1
Chapter 4. Stem cells	4	0	1

Chapter 5. Genetic modification animals	3	0	1
Chapter 6. Biotechnology in animal husbandry	3	1	3
Total	20	3	7

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points
- Form of presentation: 20% of total points
- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. Phan Kim Ngọc, Phạm Văn Phúc, 2007. Công nghệ Sinh học trên người và động vật. NXB Giáo dục

2. Nguyễn Mộng Hùng, 2002. Công nghệ phôi sinh học động vật. NXB Đại học Quốc gia TP. HCM

3. Phan Kim Ngọc, 2002. Giáo trình thực tập cơ sở: Công nghệ sinh học động vật. NXB Đại học Quốc gia TP. HCM
4. Nguyễn Đức Lượng, 2002. Công nghệ gen. NXB Đại học Quốc gia TP. HCM
5. Regine Eibl, Dieter Eibl, Ralf Portner, Gerardo Catapano, Peter Czermak, 2009. Cell and tissue reaction engineering. Springer-Verlag Berlin Heidelberg
6. Jonh R. W. Masters, 2000. Animal cell culture. Oxford University Press

Director	**Head of Department**	**Lecturer**
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Dr. Huynh Van Chuong**	**Assoc. Prof. Dr. Nguyen Quang Linh**
		Lecturer
		(Name and signature)
		Dr. Huynh Van Chuong

7. APPLIED PLANT PHYSIOLOGY

I. INFORMATION

1.1. General information

1.1.1. Course title: **Applied Plant Physiology**

1.1.2. Course code: HPTSSH07

1.1.3. Number of credit: 2

1.1.4. Type of course: + Required: ☐

+ Optional: ☒

1.1.5. Prerequisite codes:

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English.

1.2. The goal of course

1.2.1. Knowledge: (1) Understanding the importance of plant biotechnology in biological conservation and crop production, (2) application of in vitro breeding techniques and molecular marker in selection (3) analyzing the traits and genes involved in gene transfer and (4) understanding the genetic mechanisms of the genes after transformation.

1.2.2. Skills: (1) Develop scientific topics on biotechnology application, biological preservation, propagation and selection of plant breeding (2) Group working, (3) Practice and research in the field and in the laboratory, (4) Information, media

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

Advanced Plant Biotechnology course provides learners with the achievements of plant biotechnology; in vitro breeding techniques; Molecular genetics approaches in biological conservation; Molecular marker and marker assisted breeding; Genes and traits of interest in transformation; Molecular genetics of gene expression; Production of transgenic plants, analysis of transgenic plants, testing of transgenic plants and biosafety.

1.4. Detailed content of the course

Chapter 1: Introduction

1.1. General introduction.

1.2. The achievements of plant biotechnology

1.3. Prospects and Challenges of Plant Biotechnology

Chapter 2: *In vitro* propagation

2.1. Concept

2.2. History of *in vitro* breeding

2.3. *In vitro* breeding techniques

Chapter 3: Molecular genetic approaches in biological conservation

3.1. The concept

3.2. The approach

3.3. Data analysis method

3.4. Case studies on biological conservation using molecular genetics

Chapter 4: Marker assisted breeding

4.1. The concept of marker assisted breeding (MAB)

4.2. Types of molecular marker

4.3. Application of MAB

Chapter 5: Transgenic Plants

5.1. Gene and trait interest in transformation

5.2. Molecular genetics of gene expression

5.3. Production of transgenic plants

5.4. Analysis of transgenic plants

5.5. Testing transgenic plants

5.6. Biological safety

II. LECTURER INFORMATION

1. Full name: **Truong Thi Hong Hai**

Title, degree: Assoc. Prof. Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0234 3676505; Email: tthhai@hueuni.edu.vn

Main research interests:

- Study on genetic diversity
- Genetic mapping and QTL analysis
- Plant breeding using molecular markers
- Molecular classification and identification of species
- Study on subspecies and distribution characteristics of plants
- Adapting and mitigating climate change in crop production

2. Full name: **Hoang Tan Quang**

Title, degree: Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0983735509, Email: htquang@hueuni.edu.vn

Main research interests:

- Recombinant protein/enzyme production
- Genetic diversity
- Plant cell tisue culture
- Regulation of gene expression in plants and microorganisms

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chương 1. Introduction	2	0	0
Chapter 2. *In vitro* propagation	5	1	1
Chapter 3. Molecular genetic approaches in biological conservation	5	1	1
Chapter 4. Marker assisted breeding	5	1	1

Chapter 5. Transgenic Plants	5	1	1
Total	22	4	4

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points

- Form of presentation: 20% of total points

- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. Plant biotechnology and genetics, 2008. Ed: C. Neal Stewart JR. University of Tennessee, Knoxville, Tennessee. Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

2. Molecular genetics approaches in conservation, 1996. Ed. Thomas B. Smith and Robert K. Wayne. Publisher Oxford University Press, Inc. New York.

3. Quantitative genetics, genomics and plant breeding, 2002. Ed. Manjit S. Kang. Publisher: CABI Publishing, UK.

Director	Head of Department	Lecturer
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Assoc. Prof. Dr. Nguyen Thi Thu Lien**	**Assoc. Prof. Dr. Truong Thi Hong Hai**

Lecturer

(Name and signature)

Dr. Hoang Tan Quang

8. APPLIED MICROBIOLOGY

I. INFORMATION

1.1. General information

1.1.1. Course title: **Applied Microbiology**

1.1.2. Course code: HPTSSH08

1.1.3. Number of credit: 2

1.1.4. Type of course:+ Required: ☐

+ Optional: ☒

1.1.5. Prerequisite codes:

1.1.6. Requirements for the course (if applicable):

Students must have self study methodology, literature review, group study, reading and understanding in English.

1.2. The goal of course

1.2.1. Knowledge: (1) Improving knowledge on advanced application of microorganism in agricultural, textile industry, paper industry, food industry, environment treatment, pharmaceutical and chemical (2) Understanding the importance factors on enhancement the application of microorganism using recombinant DNA technology (3) Understating and applying microbiology in industry.

1.2.2. Skills: (1) Development of a fermentation processing by microorganism for production (2) Presentation a scientific report (3) Writing scientific report.

1.2.3. Attitude: Attendants must have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

The course provides advanced knowledge in the field of microbiology including fertilizer and pesticide production, application microorganism on protection and bioremediation, food technology, production of common chemicals and pharmaceuticals, production microbial enzymes, production vaccine, cells immobilization and biosensors. The students will have ability to apply microorganism in modern industries as well as

having self study methodology.

1.4. Detailed content of the course

Chapter 1: Microbial technology and biotechnology

1.1. Introduction

1.2. Healthcare Industry and GMMOs

1.3. GMMOs in Agriculture

1.4. GMMOs in Textile Industry

1.5. Environmental Applications of GMMOs

1.6. Food Industry and the Role of GMMOs

1.7. GMMOs for Bioethanol Production

Chapter 2: Fermentation technology

2.1. Introduction

2.2. Batch fermentation

2.3. Continuous fermentation

2.4. Fed-Batch fermentation

2.5. Fed-batch culture

2.6. Solid substrate fermentation

Chapter 3: Agricultural applications of microbes

3.1. Introduction

3.2. Biofertilisers

3.3. Biopesticides

3.4. Biological control

Chapter 4. Environment and microbes

4.1. Introduction

4.2. Microbial Bioremediation

4.3. Biodegradation of xenobiotic compounds

4.4. Bioremediation of heavy metals

4.5. Biomining

Chapter 5. Microbes in the food industry

5.1. Introduction

5.2. Fermented foods

5.3. Fermented beverages

Chapter 6. Microbes in production of commodity chemicals

6.1. Introduction

6.2. Bioethanol production

6.3. Industrial production of acrylamide

6.4. Industrial production of citric acid

6.5. Microbial production of adipic acid

6.6. Microbial production of 1,2-propanediol

Chapter 7. Microbes in production of fine chemicals

7.1. Introduction

7.2. Microbial production of pharmaceutical fine chemicals

7.3. Engineering microbes in the production of plant products

7.4. Microbial synthesis of vitamins

7.5. Production of amino acids

7.6. Microbes in the production of dyes and pigments

7.7. Microbial production of flavors and fragrances

Chapter 8. Microbial enzymes and their industrial application

8.1. Introduction

8.2. Application of microbial enzymes

8.3. Chemical industry

8.4. Food and feed industry

8.5. Detergent

8.6. Textite and leather industries

8.7. Pulp and paper processing

8.8. Biofluels

8.9 Personal care products

Chapter 9. Strategies of strain improvement of industrial microbes

9.1. Introduction

9.2. Spontaneous mutations

9.3. Classical mutagenesis

9.4. Recombinant DNA technology

9.5. Precision engineering technology

Chapter 10. Vaccines and their production

10.1. Introduction

10.2. Traditional vaccines

10.3. Modern vaccines

Chapter 11. Immobilisation and Biosensors

11.1. Introduction

11.2. Strategies of whole cell immobilization

11.3. Microbes as biosensors

II. LECTURE INFORMATION

1. Name: **Nguyen Duc Huy**

Academic title: Doctor

Institution: Institute of Biotechnology, Hue University

Institution address: Provincial Road number 10, PhuThuong commune, PhuVang, district, Thua Thien Hue province

Phone: 054 3525544; email: ndhuy@hueuni.edu.vn

Main research interests:

- Production biomass and high value compounds from microorganisms.
- Optimization the cultivation and production microorganisms
- Application recombinant DNA technology on microorganisms.
- Upscale the production in fermenter

2. Full name: **Truong Thi Hong Hai**

Title, degree: Assoc. Prof. Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0234 3676505; Email: tthhai@hueuni.edu.vn

Main research interests:

- Study on genetic diversity
- Genetic mapping and QTL analysis
- Plant breeding using molecular markers
- Molecular classification and identification of species
- Study on subspecies and distribution characteristics of plants
- Adapting and mitigating climate change in crop production

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chapter 1. Microbial technology and biotechnoloy	1	0	0
Chapter 2. Fermentation technology	2	0	1
Chapter 3. Agricultural applications of microbes	2	1	0
Chapter 4. Environment and microbes	2	0	1
Chapter 5. Microbes in the food industry	2	0	1
Chapter 6. Microbes in production of commodity chemicals	2	1	0
Chapter 7. Microbes in production of fine chemicals	2	0	1
Chapter 8. Microbial enzymes and their industrial application	2	0	1
Chapter 9. Strategies of strain improvement of industrial microbes	2	1	0

Chapter 10. Vaccines and their production	2	0	1
Chapter 11. Immobilisation and Biosensors	1	0	1
Total	20	3	7

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) Presentation (3) Assignment (4) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 40%

* Assignment: 40%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points

- Form of presentation: 20% of total points

- New ideas and ideas applied to production practice: 30% of total points

III. REFERENCES

1. Sanjai Saxena. Applied Microbiology. Springer. 2015.

2. Lương Đức Phẩm. Công nghệ vi sinh. Nhà xuất bản Khoa học và Công nghệ. 2015.

3. Nguyễn Hoàng Lộc. Giáo trình Nhập môn Công nghệ sinh học. Nhà xuất bản Đại học Huế. 2007

Addition reference

1. Gerard J. Tortora, Berdell R. Funke, Christine L. Case. Microbiology: An Introduction

(12th Edition). 2016.

2. Jacquelyn G. Black và Laura J. Black . Microbiology: Principles and Explorations (9th Edition). 2015.

Director	**Head of Department**	**Lecturer 1**
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Dr. Nguyen Duc Huy**	**Dr. Nguyen Duc Huy**
		Lecturer 2
		(Name and signature)
		Assoc. Prof. Dr. Truong Thi Hong Hai

9. ANIMAL BREEDING AND GENETICS

I. INFORMATION

1.1. General information

1.1.1. Course title: Animal Breeding and Genetics

1.1.2. Course code: HPTSSH09

1.1.3. Number of credit: 2

1.1.4. Type of course: + Required: ☐

+ Optional: ☒

1.1.5. Prerequisite codes: Genetics, Biochemistry, Human and animal physiology

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English.

1.2. The goal of course

1.2.1. Knowledge: (1) Understanding the basic and advanced knowledge of genetics (2) Understanding the genetic property of animal for breeding (3) Understanding animal behaviors selection for high production (4) Understanding the procedure for animal selection and the methods for production high quality.

1.2.2. Skills: (1) Searching and reviewing international and domestic literatures (2) Group working, (3) Analytical, identification and generation research fields.

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

The course provides advanced knowledge of animal genetics for breeding. Students will have ability to identify the different of species from oversea and domestic. Students also are able to identify the sexual of animal. Especially, the course helps students to methods for selection animal for breeding, hence, increasing the productivity of animal.

1.4. Detailed content of the course

Chapter 1: Animal breeding

1.1. Introduction

1.2. Animal breeding

1.3. Imported breeding and the use

Chapter 2: Genetics of skin color, hair

2.1. Theoretical and practical of research field

2.2. Genetic mechanism of pigmentation process

Chapter 3: Gender Genetics

3.1. The concept and purpose of studying on animals sexual genetics

3.2. Theoretical of sexual identification

3.3. Sexual expression in special animals

3.4. Gender regulation

Chapter 4: Genetics of animal immunology

4.1. Introduction

4.2. Antigen and antibody

4.3. Application of Immunology in animal genetically study

Chapter 5: Blood genetics and biochemical

5.1. Blood genetics in animals

5.2. Hemoglobin genetics and serum proteins

5.3. Isozyme genetics

Chapter 6. Genetics of behaviors

6.1. Introduction

6.2. Behavior in animals

6.3. Behavior classification

6.4. Genetics of human behavior

Chapter 7. Population analysis

7.1. Variable of quantitative properties

7.2. Analysis of phenotype of population variation

7.3. Characteristic parameters of population variation and application

Chapter 8. Genetically of animal selection and breeding

8.1. Selection and evaluation of livestock and poultry

8.2. Genetically theories of animal selection for breeding

8.3. Advantages of hybrid

II. LECTURER INFORMATION

1. Full name: **Assoc. Prof. Nguyen Quang Linh**

Place of work: Institute of Biotechnology, Hue University

Contact address: Hue University

Phone: 0914007474, Email: nguyenquanglinh@hueuni.edu.vn.

2. Full name: **Huynh Van Chuong**

Title, degree: Dr.

Place of work: Institute of Biotechnology, Hue University

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Main research interests:

- Livestock breeding

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chapter 1. Animal breeding	2	0	0
Chapter 2. Genetics of skin color, hair	2	2	0
Chapter 3. Gender Genetics	2	2	0
Chapter 4. Genetics of animal immunology	2	0	0
Chapter 5. Blood genetics and biochemical	2	0	0
Chapter 6. Genetics of behaviors	2	2	0
Chapter 7. Population analysis	3	0	0
Chapter 8. Genetically of animal selection and	3	2	0

breeding			
Practical	0	0	4
Total	18	8	4

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points

- Form of presentation: 20% of total points

- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. Trịnh Đình Đạt, Di truyền học chọn giống động vật, Nxb Đại học Quốc gia Hà Nội, 2002, 217 tr.

2. Đặng Hữu Lanh, Trần Đình Miên, Trần Đình Trọng, Cơ sở di truyền chọn giống động vật, Nxb Giáo dục, 1999, 473 tr.

3. Phan Cự Nhân, Cơ sở di truyền tập tính, Nxb Đại học Quốc gia Hà Nội, 1998, 151 tr.

Additional reference

1. Dent D. (2000) Insect Pest Management. CABI

2. Hồ Khắc Tín (1980) Giáo trình côn trùng nông nghiệp Tập 1. Nhà xuất bản Nông nghiệp

3. Iakhontov, V. V. (1972) Sinh thái học côn trùng. Bản dịch của Phạm Bình Quyền, Lê Đình Thái. Nhà xuất bản Khoa học và Kỹ thuật

4. Larry P. Pedigo (1996) Entomology and Pest Management. Macmillan Publishing Company. New York.

5. Norman F. Johnson, Charles A. Triplehorn (2004) Borror and DeLong's Introduction to the Study of Insects. Brooks Cole

6. Rami A. Horowitz (2004) Insect Pest Management: Field and Protected Crops. Springer

7. Richard J. Elzinga (2003) Fundamentals of Entomology, Sixth Edition. Prentice Hall

Director	**Head of Department**	**Lecturer 1**
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Dr. Huynh Van Chuong**	**Assoc. Prof. Dr. Nguyen Quang Linh**
		Lecturer 2
		(Name and signature)

Dr. Huynh Van Chuong

10. ADVANCED CELL TECHNOLOGY

I. COURSE INFORMATION

1.1. General information

1.1.1. Course title: Advanced Cell Technology

1.1.2. Course code: HPTSSH10

1.1.3. Number of credit: 2

1.1.4. Type of course:+ Required: ☐

+ Optional: ☒

1.1.5. Prerequisite codes: Cell biology, Molecular biology, DNA recombinant technology.

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English.

1.2. The goal of course

1.2.1. Knowledge: (1) Enhance knowledge of cell biology, intracellular transport, cell regulation, cellular self-destruction, and cellular interaction, with particular attention to the mechanisms and molecules involved in regulating cell activity, (2) Analysis and application of concepts and theory on cell technology, (3) Through a series of activities, learners learn how to design and implement experiments, to answer questions related to the science of cell technology.

1.2.2. Skills: 1) Enhance skill of data analysis, report writing (2) Group working, (3) Practice, research in the laboratory and field.

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

The main content of the course is to introduce students to the knowledge about:

- Introduction to Cytology and Cell technology: Cell pathways and cellular communication, Growth and kinetics of cell growth, Intracellular metabolism based on

facilitating access to modern cell biology achievements.

- Plant, animal, microorganism cell technology and applications.
- Sterm cell and differentiation.
- Methods of analysis and cultural techniques.

1.4. Contents

4.5. Protoplast fusion

Chapter 5. Recombinant DNA technology

5.1. Cloning and expression

5.2. Stabilization of recombinant microorganisms

5.3. Genetic transformation in plant cells

5.4. Genetic transformation in animal cells

Chapter 6. Stem cells and differentiation

6.1. The role of stem cells in tissue and organ development

6.2. Types of stem cells: embryonic stem cells, adult stem cells (blood, skin, intestines, neural stem cells and cancer cells)

6.3. Concepts of reprogramming, cloning, and molecular basis of revitalization

6.4. Stem cells and therapies, new problems in stem cell technology

Chapter 7. Methods of Analysis and Culture Technology

7.1. Sterilization methods

7.2. Agitation

7.3. Design of fermentation system

7.4. Design of photobioreactor systems

II. LECTURER INFORMATION

1. Full name: Nguyen Xuan Huy

Title, degree: Dr.

Place of work: Dept. Biology, College of Education, Hue University

Contact address: Institute of Biotechnology, Hue University

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Main research interests:

- Recombinant protein/enzyme production
- Genetic diversity
- Plant cell tissue culture
- Regulation of gene expression in plants and microorganisms

2. Full name: **Nguyen Thi Thu Lien**

Title, degree: Assoc. Prof. Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0936490805; Email: nttliencnsh@hueuni.edu.vn; nthuliencnsh@gmail.com

Main research interests:

- Molecular markers
- Biodiversity
- Phycology and Plant Biotechnology

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chapter 1. Introduction to Cytology and Cell technology	2	0	1
Chapter 2. Microbial cultivation	2	0	1
Chapter 3. Animal cell cultivation	4	0	2
Chapter 4. Plant cell cultivation	4	1	2
Chapter 5. Recombinant DNA technology	2	0	2
Chapter 6. Stem cells and differentiation	2	1	
Chapter 7. Methods of Analysis and Culture Technology	2		2
Total	18	2	10

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on

the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points

- Form of presentation: 20% of total points

- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. Nguyen Hoang Loc. 2006. Cell technology. Hue University Publisher.
2. Pouton, C.W. and Haynes, J.M. 2005. Pharmaceutical applications of embryonic stem cells. *Adv. Drug Del. Rev.*; 57: 1918–1934
3. Atkinson B and Mavituna F. 1991. Biochemical Engineering and Biotechnology Handbook. 2nd ed. *Stockton Press*, New York, USA.
4. Ratledge C and Kristiansen B. 2002. Basic Biotechnology. *Cambridge University Press*, UK.
5. Asenjo JA and Merchuk JC. 1995. Bioreactor System Design. *Marcel Dekker, Inc.* New York, USA.
6. Vogel HC and Todaro CL. 1997. Fermentation and Biochemical Engineering Handbook (Principles, Process Design, and Equipment). 2nded. *Noyes Publications*. New Jersey, USA.

Director	Head of Department	Lecturer
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Assoc. Prof. Dr. Nguyen Thi Thu Lien**	**Dr. Nguyen Xuan Huy**
		Lecturer
		(Name and signature)
		Assoc. Prof. Dr. Nguyen Thi Thu Lien

11. APPLIED BIOINFOMATICS

I. INFORMATION

1.1. General information

1.1.1. Course title: **Applied Bioinfomatics**

1.1.2. Course code: HPTSSH11

1.1.3. Number of credit: 2

1.1.4. Type of course: + Required: ☐

+ Optional: ☒

1.1.5. Prerequisite codes: Molecular biology, Bioinformatics

1.1.6. Requirements for the course (if applicable):

Students must have self-study methodology, synthesis of materials, group study methods, reading and understanding in English, using computer and seminar skill

1.2. The goal of course

1.2.1. Knowledge: (1) Improving the knowledge of the applicability of computer science in biological research, (2) Understand how to collect and process data obtained from molecular biology experiments, (3) Using bioinformatics tools to analyze DNA and protein sequences, protein structural analysis, genome analysis, and gene expression analysis.

1.2.2. Skills: (1) Practical skills to use advanced bioinformatics tools; (2) Ability to use bioinformatics as a complement for experimental studies; (3) Group work

1.2.3. Attitude: Attendants have serious academic attitudes; full participation in theoretical, practical and field lessons; active self-study, searching reference and participation in group discussions.

1.3. Course summary

The course is designed specifically for students who have a strong life science background and have already learn the basics of bioinformatics. All key areas of bioinformatics are covered including advanced sequence alignment, gene and promoter prediction, molecular phylogenetics, structural bioinformatics, genomics, and proteomics in advance level.

1.4. Detailed content of the course

Chapter 1: Advanced sequence alignment

1.1. Multiple alignment analysis

1.2. Consensus sequence and study on mutational variability

1.3. Protein motifs and domain prediction.

Chapter 2. Gene and promoter prediction

2.1. Prediction algorithms and programs

2.2. Promoter and regulatory element prediction

2.3. Gene prediction in prokaryotes vs. eukaryotes

Chapter 3. Molecular phylogenetics

3.1. Review on molecular evolution and molecular phylogenetics

3.2. Gene phylogeny vs. species phylogeny

3.3. Techniques in building phylogenetic trees

3.4. Phylogenetic tree evaluation.

Chapter 4. Protein structure prediction

4.1. Secondary and tertiary structure prediction

4.2. Threading and fold recognition;

Chapter 5. Genomics

5.1. Genome mapping, assembly, and comparison

5.2. Functional genomics

Chapter 6. Proteomics

6.1. Technology of Protein Expression Analysis

6.2. Posttranslational Modification

6.3. Protein Sorting

6.4. Protein-Protein Interactions.

Chapter 7. Application of bioinformatics in computer-aided drug design

II. LECTURER INFORMATION

1. Full name: **Hoang Tan Quang**

Title, degree: Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0983735509, Email: htquang@hueuni.edu.vn

Main research interests:

- Recombinant protein/enzyme production
- Genetic diversity
- Plant cell tissue culture
- Regulation of gene expression in plants and microorganisms

2. Full name: **Truong Thi Hong Hai**

Title, degree: Assoc. Prof. Dr.

Place of work: Institute of Biotechnology, Hue University

Contact address: Institute of Biotechnology, Hue University

Phone: 0234 3676505; Email: tthhai@hueuni.edu.vn

Main research interests:

- Study on genetic diversity
- Genetic mapping and QTL analysis
- Plant breeding using molecular markers
- Molecular classification and identification of species
- Study on subspecies and distribution characteristics of plants
- Adapting and mitigating climate change in crop production

III. TEACHING -STUDYING METHOD

Contents	Method		
	Theory	Homework	Discussion, practice
Chapter 1: Advanced sequence alignment	2	1	1
Chapter 2. Gene and promoter prediction	2	1	1
Chapter 3. Molecular phylogenetics	2	1	1
Chapter 4. Protein structure prediction	3	1	1

Chapter 5. Genomics	2	1	1
Chapter 6. Proteomics	2	1	1
Chapter 7. Application of bioinformatics in computer-aided drug design	3	1	1
Total	16	7	7

IV. POLICIES FOR MODULE AND METHODS, FORMS OF INSPECTION - EVALUATION OF STUDY RESULTS

4.1. Policy for the credit

Evaluation will be done throughout the learning process. The results are based on the following criteria: (1) attendance, (2) results of group discussions, (3) assignments, (4) practice and (5) final exams.

4.2. Examination method – evaluation of learning outcomes

Exams and evaluations are subject to the content and requirements of the unit, including: written tests (short answers, right and wrong questions, multiple choice tests, open-ended questions, etc.), self assessment, cross evaluation, practice assessment, evaluation of reports

4.2.1. Inspection - regular assessment: 20%

4.2.2. Periodic inspections, including:

* Final Exam: 60%

* Assignment: 20%

4.2.3. Criteria for assessing types of assignments

- Correct required content: 50% of total points

- Form of presentation: 20% of total points

- New ideas and ideas applied to production practice: 30% of total points

V. REFERENCES

1. Developing Bioinformatics Computer Skills by Cynthia Gibas, Per Jambeck , Publisher: O'Reilly Media , 2001.
2. Essential Bioinformatics, Jing Xion. Publisher: Cambridge University Press, 2006.
3. Mahdavi MA (editor). Bioinformatics - trends and methodologies. InTech, Rijeka,

Croatia, 2011. ISBN 978-953-307-282-1

4. Jones NC, Pevzner P. An introduction to algorithms in bioinformatics. MIT Press, 2004, ISBN 978-0262101066
5. Zvelebil M, Baum J. Understanding bioinformatics. Garland Science, London, 2007 ISBN 978-0815340249

Director	**Head of Department**	**Lecturer 1**
(Name and signature)	*(Name and signature)*	*(Name and signature)*
Assoc. Prof. Dr. Truong Thi Hong Hai	**Dr. Hoàng Tan Quang**	**Dr. Hoang Tan Quang**
		Lecturer 2
		(Name and signature)
		Assoc. Prof. Dr. Truong Thi Hong Hai