MINISTRY OF EDUCATION
AND TRAINING
CAN THO UNIVERSITY

COURSE SYLLABUS

1. INFORMATION OF COURSE AND LECTURER

1.1. Course name and code: Aquaculture genetics
1.2. Course specification: 3 Cred. (Theory: 2; Assignment: 0; Practice: 1), 60 hours (T: 30; A: 0; P: 30)
1.3. Prerequisites courses: this course is linked with another course of Applied Biotechnology in Aquaculture.
1.4. Responsible Department: College of Aquaculture and Fisheries, CanTho University
1.5. Information of lecturer:

1. Dr. Dương Thúy Yên
Email: thuyyen@ctu.edu.vn
Co-teaching lecturers:
2. Dr. Trịnh Quốc Trọng
Email: trongtq@gmail.com
3. Dr. Nguyễn Văn Minh
Email: minhntu@gmail.com

2. COURSE DESCRIPTION

The course introduces theory of quantitative and population genetics that are applied in aquaculture and fisheries, and focus on methods in traditional genetic improvement programs, genetic engineering, and other genomic manipulations for genetic enhancement of aquatic organisms.

3. COURSE EXPECTED LEARNING OUTCOMES

By the end of this course, students will be able to:

Theoretically:

- reinforce basic knowledge on fish population genetics, quantitative genetics.
- evaluate and select approriate genetic enhancement programs for particular species.
- understand the principles and applications of molecular genetic tools used in aquaculture and fisheries.

Practically:

- design genetic enhancement programs to improve performances for economically important traits of fishes and other aquatic organisms.
- collect and analyze data from genetic enhancement programs and molecular-based studies in aquaculture and fisheries.

4. COURSE CONTENTS

Chapters	Hours (T/A/P)
Chapter 1: Basic Genetics *This chapter will provide basic theory of Mendelian and molecular genetics.* 1.1 Chromosomes and genes 1.2. Modes of inheritance 1.3 Mendelian inheritance	9/0/15

1.4. Polygenic traits 1.5. Genetic variation at the molecular levels. 1.6. Genetic makers used in Aquaculture and Fisheries Practice: - Lab work on PCR-RFLP and electrophoresis - Data analyses of co-dominant markers - Sequence analysis *In order to understand well this chapter, students should read references of [1]-Chapter 1 and [2]-Chapter 3; [5]-part 1*	
Chapter 2: Quantitative genetics *This chapter will provide knowledge on phenotypic variation, genetic variation, genetic and environmental interactions on phenotypic traits, and estimation of hertitability.* 2.1. Quantitative genetics 2.2. Variance in phenotype 2.3. Genetic variation and interaction 2.4. Heritability *In order to understand well this chapter, students should read references of [2]-Chapter 9, and [6]-Chapter 4*	3/0/0
Chapter 3: Selective breeding and hybridization *This chapter will provide important methods that are commonly applied in genetic improvment in aquaculture.* Theory 3.1. Genetic principles underlying selective breeding in aquaculture 3.2. Breeding objectives in aquaculture 3.3. Main methods for selection programs in aquaculture 3.5. Inbreeding, crossbreeding, and 3.6. Hybridization Practice - Presentation and field trip to breeding nucleus of tra catfish (*Pangasianodon hypophthalmus*), Nile tilapia (*Oreochromis niloticus*), red tilapia (*Oreochromis sp.*), and giant freshwater prawn (*Macrobrachium rosenbergii*) - PIT tagging of tra catfish, tilapia, and prawn *In order to understand well this chapter, students should read references of [2]-Chapter 4, 7, 8, and [3]*	6/0/15
Chapter 4: Chromosome manipulations *This chapter will provide principles of chromosome manipulations that are applied in improved production of aquatic species using sterile, unisex or highly homozygous cohorts of animals by means of polyploidy, gynogenesis, androgenesis, and sex reversal.*	4/0/0

Theory 4.1. Polyploidy 4.2. Gynogenesis and androgenesis 4.3. Sex reversal and breeding *In order to understand well this chapter, students should read references of [1]-Chapter 6 and [2]-Chapter 6, 10, 11, and [4]*	
Chapter 5: Gene manipulations *This chapter will provide principles of gene manipulation that are applied in* complementing *traditional breeding programmes for the improvement of quantitative and qualitative traits.* Theory 5.1. Basic concepts on gene manipulation 5.2. Applied biotechnology *In order to understand well this chapter, students should read references of [1]-Chapter 7 and [2]-Chapter 16*	4/0/0
Chapter 6: Population genetics in captive populations *This chapter will provide knowledge on principles of population genetics that are applied in the maintanance and management of genetic quality of captive broodstock populations.* Theory 6.1 Effective population size and random genetic drift 6.2. Natural seelction in captive populations 6.3. Inbreeding and outbreeding 6.4. Maintenance of Genetic Quality of Broodstock *In order to understand well this chapter, students should read references of [2]-Chapter 5; [3] –Chapter 6, [7]*	4/0/0

5. TEACHING METHODS AND ASSESSMENT

5.1. Teaching methods:

- Theory sessions include lecturing and discussion. Llectures are presented in PowerPoint slides incorporated with board drawing when needed. Reasoning questions will be asked during lecturing, which help students develop active thinking
- Practice sessions include demontratrions in selective breeding methods and molecular protocols, and hand-on experience in data analyses.

5.2. Assessment methods:

No.	Point components	Rules and Requirement	Weights
1	Midterm exam	Short-answer questions	20%
2	Partice	Individual writing reports (article-based format) and/or group presentation on results of practice sessions	40%

3	Final exam	Short-answer questions	40%

6. READING REFERENCES

[1] Beaumont A., Boudry P., Hoare K. (2010) Biotechnology and genetics in fisheries and aquaculture. 2nd Ed. Wiley-Blackwell. 193 p.

[2] Dunham A. R. (2011) Aquaculture and fisheries biotechnology: Genetic Approaches. 2nd Ed. CABI Publishing. 506 p.

[3] Gjedrem, T. (2005) Selection and breeding programs in aquaculture, Springer, 378 pp

[4] Komen, H. and Thorgaard G.H. (2007) Androgenesis, gynogenesis and the production of clones in fishes: a review. Aquaculture 269: 150-173.

[5] Liu J.Z. (2007) Aquaculture Genome Technologies. Blackwell Science. 546 p.

[6] Lutz G.C. (2001) Practical Genetics for Aquaculture. Blackwell Science. 235 p.

[7] Tave D. (1993) Genetics for Fish Hatchery Managers. Springer. 436 p.

Date: *8 October 2015*
On be half of Lecturers

Duong Thuy Yen