MINISTRY OF EDUCATION AND TRAINING
CAN THO UNIVERSITY

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

DETAILED SUBJECT OUTLINE

1. **Subject title:** **MICROBIAL GENOMICS - LABORATORY**
   - **Code:** **MM434C**
   - **Credits:** 1
   - **Work-load:** 30 lab hours + 30 self-study hours
2. **Responsible unit:** Department of Molecular Biotechnology
   Institute of Biotechnology Research and Development
3. **Prerequisites:** Introductory Microbiology - Laboratory (MI302C) or equivalents
4. **Subject objectives:** This subject aims at providing students a chance to perform laboratory works in microbial genomics thus the knowledge obtained during their Microbial Genomics lectures (MM433C) could be confirmed by practice. After completion of the subject, the students should meet the following criteria:
   - **4.1. Knowledge:** The students will obtain/gain knowledge about
     - 4.1.1. Safety requirements in a laboratory and
     - 4.1.2. The know-how of using databases, bio-informatics tools and different techniques to perform genomic science and their applications.
   - **4.2. Skills:** Each student could be able to
     - 4.2.1. Work properly in a laboratory;
     - 4.2.2. Search for their desired references;
     - 4.2.3. Perform a sequence of techniques, *i.e.*, isolation of microorganisms, DNA extraction, primer design, DNA amplification and sequencing and data analyses;
     - 4.2.4. Perceive, analyze and discuss his/her laboratory results;
     - 4.2.5. Further develop/enhance his/her laboratory skills, knowledge and technical English in genomic science; and
     - 4.2.6. Work in teams to solve genomic problems.
   - **4.3. Attitude:** The students are expected to
     - 4.3.1. Be self-discipline and responsible;
     - 4.3.2. Love life sciences;
     - 4.3.3. Love their community; and
     - 4.3.4. Be active in knowledge sharing and team works.
5. **Subject description:** This subject provides students a chance to perform laboratory works in connection with their Microbial Genomics lectures (MM433C)

thus the theoretical knowledge could be confirmed by practice. The works start from searching for references in different databases to isolation of microorganisms, DNA extraction, primer design, DNA amplification and sequencing and end up with data analyses. The students are introduced and required to practice laboratory safety regulations. Genetic diversity of bacterial populations and identification of bacteria are selected topics to run this subject.

6. Subject content:

	Lab hours	**Objectives**
Orientation meeting	1	4.1.1; 4.2.1; 4.3.1; 4.3.2; 4.3.3
Exercise 1. Searching for references 1.1. NCBI (National Center for Biotechnology Information) 1.2. Other databases	4	4.1.2; 4.2.2; 4.2.5; 4.3
Exercise 2. Isolation of microorganisms 2.1. Isolation of bacteria 2.2. Isolation of fungi	5	4.1; 4.2; 4.3
Exercise 3. DNA extraction 3.1. Bacterial DNA extraction 3.2. Fungal DNA extraction	5	4.1; 4.2; 4.3
Exercise 4. Primer design 4.1. DNAClub 4.2. FastPCR 4.3. Primer3 4.4. Primer-BLAST	5	4.1.2; 4.2.3; 4.2.4; 4.2.5; 4.2.6; 4.3
Exercise 5. DNA amplification and sequencing 5.1. Amplification of bacterial insertion sequences 5.2. Amplification of the 16S rRNA gene 5.3. Sequencing the 16S rRNA gene	5	4.1; 4.2; 4.3
Exercise 6. Data analyses 6.1. Genetic diversity of bacterial populations 6.2. DNA sequence alignment and identification of bacteria	5	4.1.2; 4.2.3; 4.2.4; 4.2.5; 4.2.6; 4.3

7. **Teaching methodology:** Student-centered and practice-based approach
   - Synchronize subject requirements with the general background, practical skills and expectations of students;
   - Provide key information in connection with the Microbial Genomics lectures (MM433C), raise questions, lead discussion of the students, summarize and provide take-home messages;
   - Provide protocols, demonstrate and explain the principles of each step;
   - Supervise students' works; and
   - Give the students group assignments where they should present a written report of each exercise.

8. **Students' responsibilities:**
   - Attend all scheduled lab hours;
   - Be self-discipline and responsible;
   - Follow all laboratory safety regulations;
   - Raise questions and provide feedbacks/comments (if any); and
   - Complete all exercises and fulfill group assignments (exercise written reports).

9. **Assessment:**

9.1. Grade components:

No.	Grade components	Requirements	Weight	Objectives
1	Exercise written reports	One week after completion of an exercise, each group of 4-5 students has to submit a well-prepared, informative and comprehensive written report. Fruitful discussion about the exercise data/results is expected.	100%	4

9.2. Grading system: Final grade is calculated as average of the grades of 6 exercise written reports. This is given from 0 to 10 rounded to one decimal place. The final grade will then be transformed into the "A-B-C-D" grading system, which corresponds to the grades of 4 to 0 provided by the grading policies of Can Tho University.

10. **References:**

	Location
[1] Jones A., Reed R., and Weyers J. 1994. Practical Skills in Biology. Addison Wesley Longman Limited, UK. 294 pages.	Molecular Biology Laboratory, Institute of Biotechnology R&D, Can Tho University
[2] Agostino M. 2013. Practical Bioinformatics. Garland Science, Taylor & Francis Group, LLC,	

USA. 367 pages.	
[3] Surzycki S. 2000. Basic Techniques in Molecular Biology. Springer, Germany. 434 pages.	
[4] Bartlett J. M. S. and Stirling D. 2003. PCR Protocols (2nd edition). Humana Press Inc., USA. 545 pages.	
[5] Benson H. J. 1998. Microbiological Applications - Laboratory Manual in General Microbiology (7th edition). McGraw-Hill Companies, Inc., USA. 468 pages.	
[6] Schaad N. W., Jones J. B., and Chun W. 2001. Laboratory Guide for Identification of Plant Pathogenic Bacteria (3rd edition). APS Press, USA. 373 pages.	
[7] Hartl D. L. and Clark A. G. 1997. Principles of Population Genetics. Sinauer Associates, Inc., USA. 542 pages.	
[8] Websites of NCBI, EMBL and DDBJ	http://www.ncbi.nlm.nih.gov/ http://www.embl.org/ http://www.ddbj.nig.ac.jp/

11. Self-study guide:

Meeting	Content	Hours	Students' activities
1	Orientation meeting Exercise 1: Searching for references	5	Look for the recommended references, read chapters Introduction, Health & Safety, Analysis and Presentation of Data and Communicating Results of book [1] and chapter 2 of book [2] and search for relevant information in book [1] and websites [8].
2	Exercise 2: Isolation of microorganisms	5	Read 19 in chapter Obtaining Specimens of book [1] and B in part I of book [6].
3	Exercise 3: DNA extraction	5	Read chapters 1, 4 and 5 of book [3], 13 in part II of book [4] and A2 and A-1 in part VI of book [6].
4	Exercise 4: Primer design	5	Read 7.4 in chapter 7 of book [2] and 19 in part III of book [4].
5	Exercise 5: DNA	5	Read chapters 8, 15 and 16 of

	amplification and sequencing		book [3], 20 in part III and part VII of book [4] and A4 in part VI of book [6].
6	Exercise 6: Data analyses	5	Read 22 in chapter Identifying Organisms and chapter Analysis and Presentation of Data of book [1], chapters 3 and 11 of book [2], part 8 of book [5], part I of book [6] and chapter 2 of book [7] and search for relevant information in book [6].

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