Division of Life Science
The Hong Kong University of Science and Technology

LIFS 3110 Biotechnological Applications of Recombinant DNA Techniques

Fall semester, 2017-2018
Credits: 3
Laboratory Time: Tuesday, 14:00 – 17:50, Room 4160, Lift 33
Tutorial Time: Wednesday, 09:30 – 10:20, Lecture Theater K

Laboratory Instructor: Bobby TK Yim (E-mail: bobby@ust.hk)
Tutorial Instructor: Prof. Tuan Anh Nguyen (Email: tuananh@ust.hk)

Course goals

The course LIFS 3110 Biotechnological Applications of Recombinant DNA Techniques comprises altogether eight laboratory exercises. The goals of these exercises are three-fold: 1) to enhance students' comprehension of what they have learnt in lectures; 2) to provide hands-on experience in the fields of Biotechnology and Molecular Biology; and 3) to prepare students for advanced laboratory studies.

Intended Learning Outcomes

On successful completion of this course, students are expected to be able to:
1. Acquire a sound knowledge of recombinant DNA methodology, gene structure and expression.
2. Perform practical skills relating to molecular biology and bacterial culturing to yield recombinant DNA / protein.
3. Demonstrate analytical awareness via interpretation of experimental results.
4. Plan and execute recombinant DNA techniques in order to determine and interpret genetic modifications.
5. Work and coordinate effectively in a group to accomplish laboratory based tasks.
6. Exhibit accuracy and independence in recording and reporting results.

Course description

Students will be given exposure to the following areas of molecular biology and recombinant DNA technology:

- Microbial culture and aseptic techniques
- Analysis of plasmid DNA by agarose gel electrophoresis
- Restriction endonuclease digestion
- Amplification of DNA by polymerase chain reaction
- DNA recovery from agarose gel
- Plasmid construction by Gibson Assembly
- Transformation of *E. coli*
- Plasmid DNA isolation

- Site-directed mutagenesis
- Quantitative analysis of recombinant proteins

Learning activity

1. Learning environment: A group of two or three students will collaborate to perform the experiments during the semester. Workbench, routinely used labwares and instruments would be assigned to and managed by each group of students.
2. Pre-lab talk: Contents would focus on basic theoretical and practical issues pertaining to the experiment.
3. Pre-lab demonstration: Specific techniques will be demonstrated by the instructor prior to each laboratory exercise; real time close-up video shot will be shown live. Right after demonstration, students will perform the same techniques by themselves. Students are expected to learn a core set of techniques that will be repeatedly used throughout the semester.
4. On-bench supervision: Teaching staff, who is a technician or postgraduate student, will serve as a bench supervisor to take care of several groups of students. Bench supervisor will provide assistance and instructions to students during the experiment.
5. Exit discussions: In some exercises, on completion of the experimental work, all students would be expected to present their results to the instructor. Additional discussions on data analysis and interpretation may be conducted on a large group-basis.

Method of assessment

1. Every student is required to submit 8 worksheets. Questions in the worksheets cover underlying principles of experiments, data reporting, data interpretation and statistical analysis.
2. In each laboratory exercise, practical performance, discipline and safety awareness of students will be assessed by the bench supervisor.
3. Every student will be assessed individually in the final examination. Knowledge on concepts and principles of recombinant DNA technology, and the ability to analyze laboratory data and competence on experimental techniques will be evaluated.

Assessment scheme

Method of assessment	Percentage	Learning outcomes to be assessed
Worksheet	24% (3% per week)	(1), (3) and (6)
Laboratory performance	12% (1.5% per week)	(1), (2), (4) and (5)
Final examination	64%	(1), (2), (3), (4) and (6)

LIFS 3110 Biotechnological Applications of Recombinant DNA Techniques
Fall Term 2017-18 Class Schedule

	Laboratory	**Tutorial**
Schedule	Tuesday, 14:00-17:50	Wednesday, 9:30-10:20
Venue	Room 4160, Lift 33	Lecture Theater K

Laboratory **Check-in and Course Introduction**
12 September Laboratory

Exercise 1 **Aseptic and microbial techniques**
19 September Laboratory
20 September Tutorial

Exercise 2 **Analysis of plasmid DNA by restriction digestion and agarose gel electrophoresis**
26 September Laboratory
27 September Tutorial

Exercise 3 **Amplification of DNA by polymerase chain reaction**
3 October Laboratory
4 October Tutorial

Exercise 4 **Plasmid construction by Gibson Assembly**
10 October Laboratory
11 October Tutorial

Exercise 5 **Transformation of Escherichia coli by plasmid DNA**
17 October Laboratory
18 October Tutorial

Exercise 6 **Plasmid mini-prep and restriction analysis**
24 October Laboratory
25 October Tutorial

Exercise 7 **QuikChange site-directed mutagenesis**
31 October Laboratory
1 November Tutorial

Exercise 8 **Quantitative analysis of recombinant green fluorescent proteins**
7 November Laboratory
8 November Tutorial

Final Examination
To be determined