Subject Description Form

Subject Code	ABCT3116
Subject Title	Experimental Approach in Molecular Biology and Biochemistry
Credit Value	3
Level	3
Pre-requisite	DNA Technology, Biochemical Techniques
Objectives	This subject is a laboratory-based subject which will provide students a hands- on experience of designing, performing, and analyzing results from a molecular biology/biochemical mini-project.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Have a deep understanding of the principles of DNA cloning, DNA analysis, site directed mutagenesis, and protein expression analysis; (b) Plan and carry out a mini-project that require the above techniques; (c) Develop good technical skills, analyze collected data and present data; (d) Keep an exact record of the work performed and the results observed; (e) Present findings of the mini-project in the form of a written report. (f) Present a scientific article about site-directed mutagenesis by an oral presentation.
Subject Synopsis/ Indicative Syllabus	Students will be presented with a problem or task that requires the use of at least the following molecular biology and biochemical techniques: (a) Site-directed mutagenesis using PCR, restriction digestion, plasmid cloning vectors; (b) Transformation into bacterial cells for amplification and purification from bacterial cells; (c) Protein expression, extraction, purification and characterizations; (d) DNA gel electrophoresis, Protein SDS-PAGE, DNA sequencing; (e) Study of protein modification and its implications Students will be asked to plan experiments and present it in the form of a proposal. Students will carry out the experiments involving the above techniques and collect data from their work. Students will meet tutors frequently to discuss the experiment progress and finalize details of coming laboratory work. Students will write up a report to present their work and findings. Students will present a scientific article in front of the whole class.
Teaching/Learning Methodology	No formal lectures will be provided but a briefing session on the requirement of this subject and the assessment criteria. Students are expected to have learnt the basic principles of the experiments in the subjects of "DNA Technology" and "Biochemical Techniques". Students will be asked to plan experiments to complete a task and present it in the form of a proposal. Students will carry out the experiments with provided manuals. Weekly one-hour tutorials will be held before the experiments for students to understand the theory of the experiments. Students are expected to write their own log books for preparation of the coming experiment. Students have to record the exact procedures used and to record the results obtained in the logbook. To conclude the subject, each student will prepare a written report on the experiments and the findings.

Short quiz will be delivered to test students' understanding of the experiments.
Oral presentation is also required for students to present an article about site-directed mutagenesis and correlate with the knowledge learnt from the course.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
1. Attendance	10	✓		✓			
2. Tutorial exercise	10	✓		✓			
3. Lab performance	20	✓	✓				
4. Lab proposal	15	✓	✓	✓	✓		
5. Lab quizzes	10	✓					
6. Lab report	25	✓		✓		✓	
7. Presentation	10						✓

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
Through the proposal writing, students will be assessed on their understanding of the mini-project. They will be required to plan a strategy to accomplish a project with the use of these gene techniques.
Attendance of both tutorial and lab class are counted. Quiz will be delivered to students to test their understanding on the theory of experiments. Their experimental work, safe working environment and technical skills will be assessed on the spot in the laboratory in every session, in order to gauge their capability in carrying out the mini-project.
Their ability or attitude in keeping an accurate and timely record will be assessed through the laboratory notebooks.
In the final written report, students will be assessed on their ability to convey their findings in the written form, their analysis of the data, their interpretation of the results, as well as their ability to suggest follow-up studies.
Students will present an article related to the studied technique. They will be assessed basing on the content accuracy, presentation style, fluency and time management.

Students are required to attend at least 75% of scheduled sessions for the subject. Students fail to fulfill the attendance requirement will lose attendance score and not be eligible to register ABCT4108.

Student Study Effort Expected

Class contact:	
▪ Lectures/Tutorials	8 Hrs.
▪ Laboratory	28 Hrs.
▪ Oral Presentation	3 Hrs.
Other student study effort:	
▪ Self study	50 Hrs.
▪ Data Analysis and Report Writing	30 Hrs.
Total student study effort	119 Hrs.

Reading List and References

1. Current protocols in molecular biology" published by the Wiley and Sons (an excellent collection of all useful protocols; electronic version can be accessed via Internet from PolyU library)
   http://www.mrw.interscience.wiley.com/emrw/9780471142720/home

2. www.protocol-online.org (a free and extensive collection of biological protocols)

	3. "Biotechnology explorations: applying the fundamentals" by Scheppler/Cassin/Gambier published by the American Society for Microbiology 4. "Molecular biology: a project approach" by Karcher published by the Academic Press 5. "A pGLO Bacterial Transformation Kit Extension", Application note, Biorad 6. Leung YC, et al. (1994), Site-directed mutagenesis of beta-lactamase I: role of Glu-166, Biochem J., 299(Pt 3):671-8 7. Wong WT, Au HW, Yap HK, Leung YC, Wong KY, Zhao Y. (2011), Structural studies of the mechanism for biosensing antibiotics in a fluorescein-labeled β-lactamase, BMC Struct Biol, 11(15) 8. Au, H. W., Tsang, M. W., So, P. K., Wong, K. Y., & Leung, Y. C. (2019), Thermostable β-lactamase mutant with its active site conjugated with fluorescein for efficient β-lactam antibiotic detection, ACS omega, 4(24), 20493–20502 9. Fu JL, et al. (2015), GFP Loss-of-Function Mutations in Arabidopsis thaliana, G3 (Bethesda). 5(9):1849-55.