The Hong Kong University of Science and Technology

UG Course Syllabus

Bioengineering Laboratory

BIEN3910

4 Credits

Prerequisites: BIEN2410 AND BIEN 2610

Corequisite: BIEN 3410

Instructor Name: LINARDI, Darwin

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Office Hours: By appointment

Course Description

This course provides hands-on experience with molecular biotechnology, biomolecular engineering, biosensors, biomedical devices, and bioanalytical techniques. Laboratory experiments including cell culture, genetic engineering techniques, bioanalytical methods, biosensors, and biomedical devices, with additional emphasis on data analysis. For students of the CBE department only.

Intended Learning Outcomes (ILOs)

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

1. Describe the principles behind the experimental modules and how they are applied in the experiments (tentatively molecular biotechnology, biomaterials, biosensors, sequencing, and bioimaging).
2. Design and conduct experiments relevant to the bioengineering discipline.
3. Process, analyze, and interpret experimental data in a statistically sound manner.
4. Develop soft skills, including teamwork, open-ended problem solving, report writing, and presentation.

Assessment and Grading

This course will be assessed using criterion-referencing, and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Pre-lab exercise	5%	Before every class
Laboratory preparation	5%	Before every class
Pre-lab quizzes	10%	Before every class
Laboratory performance	5%	End of every class
Laboratory reports	45%	One week after every class
Final examination	30%	End of semester

Notes on assessment:

Attendance:

All of the lecture and tutorial sessions are compulsory! Students must be well prepared for each tutorial session (read the lab manuals, tutorial slides, recommended readings, demonstration video, etc.)

Absence/ Late:

Absence in a tutorial or laboratory session will be penalized, except for an instructor-approved reason (e.g., sickness proven with a letter from a medical doctor).

Tutorial session	1 point will be deducted from the overall grading
Lab session	2 points will be deducted from the overall grading

Students who are late for a presentation in a tutorial will not be given any presentation marks. Students who are late more than 15 minutes in a lab session will not be given any marks in the lab performance. The technical staff reserve the right to cut marks from the lab report according to work done by other team members.

Leaving the lab:

Whenever you need to leave the laboratory during the assigned laboratory hours, please inform at least one of the technical staff.

Policy on report submissions

Late submission: 10% of the original marks will be deducted from the report mark for submissions late by one day from the scheduled submission date, and a further 5% each day for submission late by 2-7 days.

For example, if the original mark is 70 and the report is submitted 2 days late, the final mark is 59.5 (70-70X0.1 - 70X0.05 = 59.5). Reports submitted more than one week after the scheduled submission date will receive zero marks.

Plagiarism and fabrication of data

Any report presenting fabricated data or results will be severely penalized. Plagiarism will be severely penalized.

Whoever is found:

1. Copying somebody's report/assignment

2. Allowing his/her report/assignment to be copied

3. Copying from past reports, books, or web pages

will result in Zero Marks.

All reports involved in plagiarism will be given **Zero** Marks.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Pre-lab exercise	ILO1	This exercise helps students articulate theoretical principles and their applications before engaging in experiments.
Laboratory preparation	ILO2	Preparation ensures that students plan experiments effectively, applying theoretical knowledge to practical situations.
Pre-lab quizzes	ILO1, ILO2	Quizzes assess understanding of theoretical principles and data analysis techniques, ensuring readiness for lab work.
Laboratory performance	ILO2, ILO4	Performance evaluates practical execution of experiments and teamwork, addressing both technical and interpersonal skills.
Laboratory reports	ILO3, ILO4	Reports require students to analyze data and communicate findings, reinforcing both analytical and writing skills.
Final examination	ILO1, ILO3	The examination tests a comprehensive understanding of principles and data analysis across all topics covered in the course.

Grading Rubrics

Laboratory preparation				
Criteria	Excellent (3)	Good (2)	Needs Improvement (1)	Unsatisfactory (0)
Clarity and Understanding of Protocols	Clearly articulates the objectives and protocols of the lab session; demonstrates thorough understanding.	States protocols well; minor gaps in understanding but generally clear.	Vague understanding of protocols; audience has difficulty grasping the plan.	Unclear or incorrect understanding of protocols; fails to convey basic procedures.
Engagement and Delivery	Engaging delivery with excellent eye contact and clear articulation; fully captures audience interest.	Good delivery; maintains some eye contact and engages audience but could improve enthusiasm.	Lacks engagement; minimal eye contact; audience is somewhat disinterested.	Poor delivery; no eye contact; fails to engage audience at all.

Laboratory performance				
Criteria	Excellent (3)	Good (2)	Needs Improvement (1)	Unsatisfactory (0)
Lab Notebook Preparation	Lab notebook is thoroughly prepared, well-organized, and contains detailed entries for all experiments.	Notebook is mostly organized; minor details may be missing but generally well-kept.	Notebook is poorly organized; significant entries are missing or unclear.	No lab notebook or completely disorganized; fails to document experiments.
Active Participation	Actively participates in all aspects of the experiment, contributing significantly to group efforts.	Participates in most activities; contributes but may not lead discussions.	Limited participation; relies heavily on others; minimal contribution.	No participation; disengaged from group activities.
Execution and Safety Procedures	Executes experiments carefully and correctly; consistently follows safety procedures and demonstrates a positive attitude.	Generally executes experiments well; minor errors present; mostly follows safety protocols.	Struggles with execution; noticeable errors; sometimes neglects safety procedures.	Fails to execute experiments correctly; disregards safety protocols; negative attitude.

Laboratory Report				
Criteria	Excellent (3)	Good (2)	Needs Improvement (1)	Unsatisfactory (0)
Data Interpretation	All data is processed accurately, with thorough and meaningful interpretation; demonstrates a deep understanding of methods.	Most data is processed correctly; interpretations are generally accurate with minor errors.	Some data processing is unclear or incorrect; interpretations show limited understanding.	Major errors in data processing; interpretations are incorrect or missing.
Statistical Analysis	Appropriate and comprehensive statistical analyses are conducted; results are interpreted meaningfully and accurately.	Good statistical analyses with minor inaccuracies; results are mostly interpreted correctly.	Limited statistical analysis; some results are misinterpreted or lack clarity.	No statistical analysis provided or completely incorrect interpretations.
Clarity and Structure	Report is well-structured and clearly written; ideas are logically organized and easy to follow.	Generally clear and structured; some areas may lack clarity or organization.	Report lacks clear organization; ideas are difficult to follow, affecting overall understanding.	Disorganized and unclear; fails to communicate ideas effectively.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of lab protocols and concepts, showcasing exceptional skills in data processing and statistical analysis. Actively engages in experiments, exhibiting leadership and collaboration, while producing high-quality, well-structured reports.
B	Good Performance	Shows solid knowledge of lab procedures, with proficient skills in data handling and interpretation. Participates actively in group work and produces clear, organized reports with minor inaccuracies in data analysis.
C	Satisfactory Performance	Possesses adequate understanding of core lab concepts and protocols. Displays basic competency in data processing, but interpretations may lack depth. Participates in experiments but relies on peers for contributions; reports are generally clear but may have several inaccuracies.
D	Marginal Pass	Exhibits threshold knowledge of lab procedures and limited ability in data analysis. Participation is minimal, and reports are poorly organized with significant errors in data processing and interpretation. Shows potential for improvement but needs further development.
F	Fail	Demonstrates insufficient understanding of lab protocols and concepts, with major inaccuracies in data processing. Lacks participation in experiments and submits disorganized reports that fail to meet basic requirements. Does not demonstrate the necessary effort or understanding for the course.

Course AI Policy

ChatGPT, Poe, etc. can be used to refine your own writing and presentation or help you learn. They should not be used to complete your assignments for you.

Resubmission Policy

Only the latest work submitted by the deadline will be graded. Submissions after the deadline will be subject to grade penalties without valid reasoning.

Required Texts and Materials

No specific text or materials required.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.