CHEM3012: GENETICS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Genetics

Subject Code
CHEM - Chemistry
Course Number
3012

Academic Unit
Chemistry (CHEM)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
4

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
CHEM1200/BCH1200 Discovery in Biology

Precursors
CHEM2013/BCH2013 Microbiology

Equivalent Courses
BCH3012 Genetics
BMS3203 Genetics

Exclusive Courses
Nil

Part II Course Details

Abstract
In this course, students will:

- explore the fundamental relationships between genes and traits in "living organisms" ranging from viruses to higher eukaryotes;
- develop an understanding of a range of basic genetic principles and their application to gene mapping in viruses and bacteria;
- explain the activities and functions of DNA;
- critically review and evaluate contemporary issues related to recent advances in applied genetics and recombinant DNA technology;
- This course builds on (and complements) knowledge covered in CHEM2003 (Biochemistry), and CHEM2013 (Microbiology); and underpins the more advanced concepts and applications that are covered in CHEM3017 (Molecular Biology) and final year project (CHEM4036).

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic structure of DNA, and the processes and importance of DNA replication and genetic recombination in living cells.	20	x		
2	Describe gene and genome organisation and expression in prokaryotes and eukaryotes; and demonstrate an understanding of how genetic information is stored and expressed in cells, and the way in which phenotype is affected by both genetic and environmental effects.	20	x		
3	Demonstrate an understanding of the molecular basis of variation and mutation (and relation to evolution and population genetics), of natural and artificial genetic recombination, of extrachromosomal inheritance, of gene dosage compensation and X inactivation, and of genetic analysis and its importance in biology.	40	x	x	
4	Discover examples encountered in our daily lives, which involve the application of genetics and recombinant DNA technology and critically evaluate their impact to modern day living. Critically review, discuss and evaluate contemporary issues related to recent advances in applied genetics and recombinant DNA technology.	20		x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Group discussion activities, written assignments, quizzes and presentations	Students will undertake large and small group discussion activities, written assignments, quizzes and presentations related to different models of DNA replication and genetic recombination in viruses, bacteria and eukaryotes.	1	
2	Written assignments, tutorials and/or laboratory practicals	In large and small group sessions including written assignments, tutorials and/or laboratory practicals, students will examine the structure of prokaryotic and eukaryotic DNA and the environmental factors that govern gene expression.	2	
3	Quizzes, tutorials and/or laboratory practicals	In large and small group sessions including quizzes, tutorials and/or laboratory practicals supplemented with case examples, students will collect, process, present and interpret molecular genetic data.	3	
4	Internet resources and investigation of the literature	Through extensive use of Internet resources and investigation of the literature on genetics, students in small groups will apply their knowledge to provide daily life examples related to recent advances in applied genetics (of their choice; e.g. GM foods, genetic basis of cancer, gene therapy or human cloning, etc) and clearly communicate and evaluate their findings orally and in writing.	4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Short Quizzes	2, 3	10	-	Yes
2	Laboratory Report	1, 2, 3	10	-	Yes
3	Tutorial / Discussion	1, 2, 3, 4	10	-	Yes
4	Oral Presentation / Essay	4	10	-	Yes

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

40

Assessment Rubrics (AR)

Assessment Task

Short Quizzes

Criterion

CAPACITY for the understanding of basic genetic concept and ABILITY of utilising these concepts in real life problems

Excellent (A+, A, A-)

Student is expected to show strong evidence of subject matter and great familiarity with knowledge.

Good (B+, B, B-)

Student is expected to demonstrate evidence of subject, evidence of familiarity with knowledge.

Fair (C+, C, C-)

Student is expected to show sufficient evidence of the subject and little familiarity with knowledge.

Marginal (D)

Student is expected to demonstrate little familiarity with the subject matter and limited evidence of knowledge.

Failure (F)

Student shows no evidence of familiarity with the subject matter and irrelevant understanding of knowledge.

Assessment Task

Laboratory Report

Criterion

ABILITY to REPORT experimental procedures and EXPLAIN the principles behind. CRITICALLY REVIEW the cause of experimental errors and DISCUSS the applications of these procedures in real life problems

Excellent (A+, A, A-)
Student is expected to show excellent understanding to experiments, finish the laboratory reports flawlessly and be well prepared in the classes.

Good (B+, B, B-)
Student is expected to have good understanding to experiments, finish the laboratory reports satisfactorily, and be prepared in the classes.

Fair (C+, C, C-)
Student is expected to demonstrate some understanding to experiments, complete the laboratory reports.

Marginal (D)
Student shows little understanding to experiments and hand in the laboratory reports and little preparation in the classes

Failure (F)
Student shows no understanding to experiments and/or do not hand in the laboratory reports.

Assessment Task
Tutorial / Discussion

Criterion
ABILITY to EXPLAIN in DETAIL and with ACCURACY basic concepts in genetics and DISCUSS their implications in real life problems

Excellent (A+, A, A-)
Student is expected to actively engage in the tutorials and discussion, ask or answer questions proactively.

Good (B+, B, B-)
Student is expected to show positive attitude towards the tutorials and discussion, ask or answer questions satisfactorily.

Fair (C+, C, C-)
Student is expected to show sufficient attitude towards the tutorials and discussion, ask or answer some questions.

Marginal (D)
Student is expected to participate the tutorials and discussion, ask or answer limited number of questions.

Failure (F)
Student show no active role or is absent in the tutorials and discussion.

Assessment Task
Oral Presentation / Essay

Criterion
ABILITY to APPLY genetic concepts in real life problems especially those involved in topical issues

Excellent (A+, A, A-)
Student is expected to give an excellent presentation and submit a prefect essay demonstrating strong knowledge in the subject matter

Good (B+, B, B-)
Student is expected to give a good presentation and submit an essay showing satisfactory knowledge in the subject matter.

Fair (C+, C, C-)
Student is expected to give a presentation and submit an essay showing sufficient knowledge in the subject matter.

Marginal (D)
Student is expected to give a presentation and submit an essay showing limited knowledge in the subject matter.

Failure (F)
Student shows no preparation for the presentation and/or does not submit the written essay.

Assessment Task
Examination

Criterion
STRONG COMMAND of genetic concepts, and ABILITY to APPLY these concepts in problem solving

Excellent (A+, A, A-)
Student is expected to show strong evidence of original thinking; good organization, capacity to analyse and synthesize the subject matter; superior grasp of knowledge is required.

Good (B+, B, B-)
Student is expected to demonstrate evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with knowledge.

Fair (C+, C, C-)
Student is expected to show sufficient evidence of the subject, little evidence of critical capacity and analytic ability; fair understanding of issues.

Marginal (D)
Student is expected to demonstrate little familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)
Student shows no evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant understanding of knowledge.

Part III Other Information

Keyword Syllabus

- Chemistry of genetic materials
- Gene structure, function and regulation
- Genetic variation, evolution and population genetics
- Genetics of viruses and bacteria
- Eukaryotic genetics
- Population genetics
- Applied Genetics

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Robert J. Brooker (2018) Genetics: analysis and principles. (6th edition), McGraw-Hill Co., Inc., USA.
2	Peter D. Snustad and Michael J. Simmons (2015) Principles of Genetics. (7th edition), Wiley, USA.
3	Online Resources: To be provided, as required, in lectures and tutorials.