

CHEM2013: MICROBIOLOGY

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Microbiology

Subject Code

CHEM - Chemistry

Course Number

2013

Academic Unit

Chemistry (CHEM)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

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

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

CHEM1200/BCH1200 Discovery in Biology (for normative 4-year students) or A Level Biology (for advance standing I students)

Precursors

Nil

Equivalent Courses

BCH2013 Microbiology

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to:

- provide a broad introduction to the diversity of microorganisms including archaea, bacteria, fungi, protists and viruses and what they do in the world at large, in soils, air and waters, in the human body, and in animals and plants;
- develop students' discovery attitude about microbes, skills at searching for and presenting information related to microbiology in clear and concise English;
- develop student skills to apply a problem-based learning approach to study microbiology events in our daily lives.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify and describe the diversity of archaea, bacteria, fungi, protists, viruses and their habitats and analyze the environmental factors that affect their growth, and identify and discuss the importance of microorganisms in both industry and public health.		x	x	x
2	Discover the different roles of microbes in our daily lives and apply basic microbiology concepts to solve daily problems related to microbiology issues.				x
3	Describe the roles of microbial secondary metabolism and explain how secondary metabolites are synthesized.		x	x	
4	Describe, compare and contrast the different agents and methods for control of microbial growth used in vitro and in humans.		x		
5	Gather and appraise information relating to microbiology, analyze and identify important messages from such information and present them in clear and concise English.			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	Lectures and tutorials	Through interactive lectures and tutorials with activities designed to develop the discovery attitude in relation to microbes' role in our daily lives, along with complementary in-class and on-line discussions, students will get involved in small group sharing and learn to describe and discuss the related subject matters.	1, 2, 3	
2	"Ask a Question" exercise, written assignments and scientific journal article review	Through appropriate "Ask a Question" exercise, written assignments, scientific journal article review, students will develop their appraisal, analytical and oral and written communication skills.	3, 4	
3	Problem-based learning activities and oral presentations	Through problem-based learning activities and oral presentations, students will practise their skills in identification of learning issues, analysis and synthesis of collected information, application of synthesised information to solve problems and presentation.	4, 5	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests	1, 2, 3	5	
2	Written assignments, scientific journal article review	1, 2, 3, 4	10	
3	PBL contribution, including oral presentations	5	15	

4	"Ask a Question" activity, in-class and online discussions, including discovery activities	1, 2, 3, 4	15	
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Continuous Assessment (%)

45

Examination (%)

55

Examination Duration (Hours)

3

Additional Information for ATs

Starting from Semester A, 2015-16, students must satisfy the following minimum passing requirement for courses offered by CHEM: "A minimum of 40% in both coursework and examination components."

Assessment Rubrics (AR)**Assessment Task**

Tests

Criterion

To verify the stat of students' learning progress

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

Written assignments, scientific journal article review

Criterion

Encourage students to think critically by allowing them to review and criticize the current scientific article

Excellent (A+, A, A-)

Student is expected to submit an excellent review demonstrating strong knowledge in the subject matter

Good (B+, B, B-)

Student is expected to submit a good review showing satisfactory knowledge in the subject matter.

Fair (C+, C, C-)

Student is expected to submit a review showing sufficient knowledge in the subject matter.

Marginal (D)

Student is expected to submit a review showing limited knowledge in the subject matter.

Failure (F)

Student fails to submit the review.

Assessment Task

PBL contribution, including oral presentations

Criterion

To challenge students to collaborate communicate and working together to solve problem as a team

Excellent (A+, A, A-)

Student is expected to give an excellent presentation demonstrating strong knowledge in the subject matter

Good (B+, B, B-)

Student is expected to give a good presentation showing satisfactory knowledge in the subject matter.

Fair (C+, C, C-)

Student is expected to give a presentation showing sufficient knowledge in the subject matter.

Marginal (D)

Student is expected to give a presentation 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

“Ask a Question” activity, in-class and online discussions, including discovery activities

Criterion

Ability to understand the materials in lectures and asking questions from critical thinking

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

Examination

Criterion

To test students' application of material taught in class and evaluate their performance

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**

- 1) Microbial diversity of archaea, bacteria, fungi, protists, viruses
 - physiological diversity (chemoorganotroph, chemolithotroph, phototroph, heterotroph, autotroph)
 - microbial systematics (phenotypic, genotypic, phylogenetic analysis)
- 2) Microbial growth
 - exponential growth
 - measuring microbial growth
 - environmental factors affecting growth
- 3) Microbial ecology
 - methods in microbial ecology (isolation, T-RFLP, DGGE)
 - how microbes interact with each other
 - descriptions of major microbial habitats
 - biofilms
- 4) Industrial microorganisms and products for the health and food industry
- 5) Microbial interactions with humans
 - normal microbial flora
 - microbial diseases (airborne, vectorborne, waterborne, foodborne, direct contact transmitted)
- 6) Microbial growth control
 - physical antimicrobial control
 - chemical antimicrobial control
 - antimicrobial drugs, in particular antibiotics and their mode of action
- 7) Microbial secondary metabolism and secondary metabolites

- polyketides and acetate pathways
- terpenoids and mevalonate and methylerythritol phosphate (MEP) pathways
- peptide biosynthesis

Reading List

Compulsory Readings

Title	
1	Nil

Additional Readings

Title	
1	Fungal Biology, J.W. Deacon (Blackwell Publishing Limited, 2006)
2	Brock Biology of Microorganisms, Michael T. Madigan, John M. Martinko, David Stahl and David P. Clark (13th ed., Benjamin Cummings, 2010)
3	Medicinal Natural Products: A Biosynthetic Approach; Paul M. Dewick (John Wiley & Sons, Ltd, 3rd Edition). The electronic version of the textbook is available from the CityU Library: https://onlinelibrary.wiley.com/doi/book/10.1002/9780470742761