

MODULE DESCRIPTION FORM

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

CL948 PRINCIPLES OF ENVIRONMENTAL MICROBIOLOGY

Module Registrar: Charles W. Knapp	Taught To (Course): MSc Environmental Engineering (compulsory); all other MSc/MRes (optional)		
Other Lecturers Involved:	Credit Weighting: 10	Semester: On-campus: spring Online learning: spring and summer	
Assumed Prerequisites: A previous class in chemistry and/or biochemistry would be helpful, but not required.	Compulsory: MSc Environmental Engineering Optional: all other programmes	Academic Level: 5	Suitable for Exchange: Yes

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	Total
10	10				10		30	40	100

Educational Aim

This class aims to introduce microbiology in a manner that is of practical importance in environmental engineering + public health.

Emphasis is placed on the microbial ecology and interactions in water, soil, and biological treatment process. Microbial physiology and biochemistry will be discussed in detail as it pertains to environmental systems. Both biodegradation and public health aspects of microbiology are included. The class combines theoretical and fundamental concepts in biology to provide a basic background in microbiology and biotechnology.

Learning Outcomes

On completion of the class the student is expected to be able to

- LO1: conversant of microbiology such that they can communicate about biological systems;
- LO2: relate principles of microbiology to understanding microbial performance and activity;
- LO3: unravel the complexity of their interactions and propose solutions to optimise their biotechnical application.

Syllabus

The class will teach the following:

1. Historical influences of microbiology and biotechnology – to the projection of future endeavours
2. Cellular biology
3. Genetics & central dogma of life
4. Biosynthesis & metabolism
5. Redox reactions & nutrient cycles
6. Enzymes
7. Population & community interactions
8. Aquatic & soil microbiology
9. Biotechnology
10. Genetic pollution

Assessment of Learning Outcomes

HW #1: Bug biography (25%)
 HW #2: Growth kinetics and ecology (25%)
 Examination: 50%
 Practice quizzes provided to help one's preparation.

For each of the Course Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1: conversant of microbiology such that they can communicate about biological systems

C1: assessment #1 – accurate and technically correct communication of microbiology

C2: examination – (same)

LO2: relate principles of microbiology to understanding microbial performance and activity

C1: assessment #1 – understanding of their nutritional and survival needs

C2: assessment #2 – understanding of how enzymatic and ecological processes impact reactor performance

LO3: unravel the complexity of their interactions and propose solutions to optimise their biotechnical application

C1: assessment #2 – be able to assess situations/project and be able to suggest mitigation strategies

C2: examination – be able to assess and suggest biotechnological strategies

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback (<https://www.strath.ac.uk/staff/policies/academic/>)

Assessment and feedback practices promote student learning

- Multiple, diverse assessments are utilised to guide student learning process
- General (class-wide) and individual assessments will be provided via MyPlace
- Feedback will be provided within two weeks of submission

Assessment and feedback practices are appropriate, fair and transparent

- Professional-quality report writing and conduct are expected in assignments
- When possible, criteria / rubrics will be provided in advance of assignments
- Feedback will be accessible via Myplace and, in most cases, will be based on pre-determined rubrics.

Assessment and feedback practices are clearly communicated to students and staff

- Course syllabus will be provided to all students on first day of class – highlighting assignment deadlines, assessment weighting and lecture order
- Rubrics will be provided for assignments
- Clarifications and further feedback could be arranged via individual meeting (if requested)

Assessment and feedback practices are continuously reviewed

- Students will have opportunities to evaluate the course (mid- and final-semester)
- Responses to evaluations (esp. mid-term) will be provided by the class registrar
- Assessments, feedback and course evaluations are reviewed by external examiner, examination boards, and accreditation reviews.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

	Examinations			Courseworks		Projects		
	Number	Month(s)	Duration	Weighting	Number	Weighting	Number	Weighting
	1	April / May	2	50%	2	2 x 25%		
L/Outcomes	Exam: all			#1: LO1; #2: LO2 and LO3				

Coursework / Submissions deadlines (academic weeks):

HW #1: Bug biography (25%) -- week 3
 HW #2: Tortoise & Hare (25%) – week 8
 Examination: 50%

Resit Assessment Procedures:

2 hr examination in August diet

PLEASE NOTE:

Students must gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of exam. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

Highly recommended reading (accessible online via library):

- *Madigan et al. (2017) Brock Biology of Microorganisms (Global Edition, 15th), Pearson Education*

Optional, selected chapters from (accessible online via library):

- *Bertrand JC, Caumette P, et al. (2015) Environmental Microbiology: Fundamentals and Applications, Springer Science +Business Media, Dordrecht*
- *Madsen EL (2015) Environmental Microbiology: from Genomes to Biogeochemistry, 2nd ed. Hoboken, NY*
- *Okafor N (2011) Environmental Microbiology of Aquatic and Waste Systems. Springer Science + Business Media, Dordrecht:*
- *Hurst CJ (2019) Understanding Terrestrial Communities. Springer Science + Business Media, Dordrecht*

Additional Student Feedback

(Please specify details of when additional feedback will be provided)

Date	Time	Room No
Mondays	10 – 12 (noon)	JW 503K
Week 4	During class	Class
Week 9	During class	Class

Session: On-demand office hours during the semester. See above for day/time/location.

Homework will be discussed > 1 week following its submission

Approved:

Course Director Signature: *Charles W. Knapp*

Date of Last Modifications: 11/08/2022

(Updated May 2018)

