NANYANG TECHNOLOGICAL UNIVERSITY

COURSE CONTENT

Academic Year	AY2023-24	**Semester**	2
Course Coordinator			
Course Code	EN2002		
Course Title	Environmental Biology and Microbiology		
Pre-requisites	Nil		
No of AUs	3		
Contact Hours	Lecture: 26 hrs; Tutorial: 13 hr; Lab: 0 hr.		
Proposal Date	12 September 2023		

Course Aims

The aim of this course is to introduce general concepts of microbiology, microbial ecology and their environmental applications. The course will provide a basic understanding of cellular organization, metabolism, function, and biological interaction of key environmental microorganisms with particular attention to biology and microbiology of the natural environment and environmental engineering processes.

Intended Learning Outcomes (ILO)

By the end of this course, you would be able to:

1. Describe cellular structure, organization and function of key environmental microorganisms.
2. Describe and distinguish main features of different types of metabolisms.
3. Quantitatively analyse microbial population growth and community biodiversity.
4. Explain the importance of ecosystems, role of microorganisms in ecosystems, and how materials cycle and energy flow in ecosystems.
5. Describe the main culture-dependent and culture-independent approaches that are usually used in microbial ecology.
6. Relate key microorganisms and microbial processes to specific environmental engineering applications and environmental public health issues.
7. Quantitatively analyse microbial processes in specific environmental engineering applications.

Course Content

S/N	Topic	Lecture Hrs	Tutorial Hrs
1.	Cell structure, metabolism and organism physiology	3	1
2.	Genetics and molecular biology	2	1
3.	Natural ecosystems and biodiversity	3	2
4.	Material and energy flows in ecosystems	2	1
5.	Biological interactions	1	
6.	Microbial ecology	3	2
7.	Public Health microbiology	1	
8.	Microbiology of water treatment	3	2
9.	Microbiology of wastewater treatment	5	2

10.	Microbiology of solid waste transformation and soil remediation	2	1
11.	Microbiology of air and air treatment	1	1
	Total:	26	13

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team / Individual	Assessment rubrics
1. Final Examination	1, 2, 3, 4, 5, 6, 7	EAB SLOs a, b, d, e, g, l	60%	Individual	
2. Continuous Assessment 1 (CA1): 4 Quizzes	1, 2, 3, 4, 5, 6, 7	EAB SLOs a, b, d, e, g, l	40%	Individual	
Total			100%		

The EAB SLOs are:

(a) **Engineering knowledge**: Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

(b) **Problem Analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

(c) **Design/development of Solution**s: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

(d) **Investigation**: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

(e) **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

(f) **The engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

(g) **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.

(h) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

(i) **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

(j) **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(k) **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and

apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

(l) **Life-long Learning**: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Formative feedback

1. Feedback will be through the dissemination of the students' performance in quizzes as well as review of the quiz questions in tutorial class.
2. Additional channel will be through individual consultation initiated by students on their particular learning needs.

Learning and Teaching approach

Class meets three times per week in lecture (2 hours) and tutorial (1 hour) format.

Approach	**How does this approach support students in achieving the learning outcomes?**
Lecture	Formal lectures on the topics with in-class discussions
Tutorial	This helps students to achieve one or more of the outcomes as they need to work on tutorial questions using the concepts and principles taught in lectures. (The class is split into 2 groups for tutorials so that the instructor-student interaction can be more effective.)

Reading and References

Beyond uploaded lecture slides, textbooks and reference materials as recommended/provided/uploaded by lecturers

Course Policies and Student Responsibilities

(1) General

Students are expected to take all scheduled tests by due dates. Students are expected to take responsibility to follow up with course notes, assignments and course related announcements.

(2) Absenteeism

Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for in-class activities.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning If you are uncertain of the definitions of any of these terms, you should go to the Academic Integrity Handbook for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Cell structure, metabolism and organism physiology	1, 2, 3	Lectures and tutorials
2	Genetics and molecular biology	1, 2	Lectures and tutorials
3	Natural ecosystems and biodiversity	3, 4	Lectures and tutorials
4	Material and energy flows in ecosystems	3, 4	Lectures and tutorials
5	Biological interactions	3, 4	Lectures and tutorials
6	Microbial ecology	3, 4, 5	Lectures and tutorials
7	Public Health microbiology	6	Lectures and tutorials
8	Microbiology of water treatment	6, 7	Lectures and tutorials
9	Microbiology of wastewater treatment	6, 7	Lectures and tutorials
10	Microbiology of solid waste transformation and soil remediation	6	Lectures and tutorials
11	Microbiology of air and air treatment	6	Lectures and tutorials