LSM3228 Course Outline

Faculty/School: Yong Loo Lin School of Medicine
Department/Programme: Department of Microbiology & Immunology / Life Sciences Major/Minor

Course Details
Course code: LSM3228
Course title: Microbiomes and Biofilms
Credits: 4 units/MCs
Max class size: 48

Course Description
In nature, microbes exist as multispecies communities (microbiota) interacting with each other and the environment/host. This typically occurs in the context of biofilms where organisms are in proximity within a protected environment of the biofilm matrix. This module primarily explores the human microbiome and its effect on development and disease and explore the role of pre- and pro-biotics in health. Mechanistic insights into microbial communities can also be gained through more controlled studies focusing on experimental biofilms. Appreciating the biology of biofilms allows us to understand the context that both human and environmental microbiota operate in.

Eligibility and Requirements
Prerequisites: GCE 'A' Level or H2 Biology or equivalent, or LSM1301
Corequisites: NIL
Advisory Pre-Requisite: LSM2191 or LSM2291
Non-allowed subjects (if any): NIL

Course Learning Outcomes
1. Recognize in detail what constitutes microbiota, microbiomes, and biofilms.
2. Explain and value the role of microbiomes in human development, health and wellness using a few detailed examples.
3. Explain the role of microbiome dysfunction in human disease with a few detailed examples.
4. Evaluate the role of microbiome modifying strategies and treatments and product claims.
5. Attribute the unique characteristics of mono-species biofilms to biofilm-specific behavior, matrix composition and microenvironment.
6. Attribute the complexity of multi-species biofilms to synergistic or antagonistic interactions.
7. Summarize and critique key findings from microbiome and biofilm research papers.
8. Create (design and perform) simple microbiome and biofilm studies, including analyzing data and reporting results.

Course Syllabus
Lecture Topics:
1. Introduction to microbes, microbiomes and research methods (sequencing approaches, analyses tools)
2. Microbiomes in development, health, beauty and wellness
3. Microbiomes in disease (cancer, metabolic diseases, aging, neurological disorders etc.)
4. Microbiome modulation (anti-, pre-, pro-, syn- and post-biotics)
5. Microbiomes beyond healthcare: agriculture, marine ecosystems, bioremediation etc.
6. Biofilms: stages, architecture, unique biology,
7. Inter-species interactions, from experimental biofilms to complex systems
8. Related talks from Industry (SME, MNCs, Clinical)

Practical Sessions:

1. Designing a microbiome study, sampling (pre-intervention)
2. Sampling (post-intervention), DNA extraction and QC, 16S library prep
3. DNA gel, Qubit HS dsDNA, DNA purification with AMPure beads, 16S sequencing
4. Set up biofilm assay. Analyze 16S sequencing results
5. Biofilm quantification and interpretation of results

Modes of Teaching

Includes lectures, group discussions, dialogues, case-based learning, and presentations. During group discussions, students will actively share their opinions and discuss the subject matter in relation to the various aspects of health in an interdisciplinary manner. Similarly for case-based learning, cases based on real life experiences and problems faced by individuals from different walks of the society will be used. This will provide a framework for students from different disciplines to work together for an in-depth examination of each case. They will be tasked to identify problems and proposed realistic solutions that incorporate the use of technology & environmental design to improve health.

Workload (weekly): Lecture (2hr), Lab Work (4hrs on even weeks), Fieldwork, Projects and Assignments (4hr), Preparatory Work (2hr)

Assessments (100% CA)

15%: Individual Assignment (Product Review + Business Pitch)
30%: CA1 (Microbiomes)
20%: CA2 (Biofilms)
35%: Lab Report: 10% group YT video on study design and rationale + 25% individual lab report on study results & discussions
No Final Exam

Lecturers

Dr Ch'ng Jun Hong (Dept. of Immunology & Microbiology, NUSmed) – Course Coordinator
Dr Png Chin Wen (Dept. of Immunology & Microbiology, NUSmed)
Ms Chan Chuu Ling (Dept. of Immunology & Microbiology, NUSmed)

LSM3228 – Microbiomes and Biofilms (AY2526)
Course Coordinator(s): Ch'ng Jun Hong
Email : micchn@nus.edu.sg :: Tel: 6516-3789

Laboratory : Mondays – 2pm to 6pm
Lectures : Thursdays – 10am to 12pm

Venue : LS Lab 9, MD4 Level 4
Venue : S16-0307

		LABORATORY (EVEN Weeks)	LECTURE
WK	**MTH**	**Monday – 2pm to 6pm**	**Thursday – 10am to 12pm**
1.	**Aug**		**14**. L1: Course Introduction + Project Groupings (CJH)
2.		**18.** Practical#1: NGNG + Group discussions on study design, intervention and sampling protocol (CJH, CCL)	**21.** L2: Microbiome research design (CJH, CCL)
3.			**28.** L3: Microbiomes in development & health (CJH)
4.	**Sept**	**01.** Practical#2: Sample processing, DNA extraction, Library Preparation (CJH, CCL)	**04.** L4: Microbiomes in degeneration & disease (CJH) *** Indv Assig due 5Sept @ 2359hrs**
5.			**11.** L5: Microbiome modulation and engineering (CJH)
6.		**15.** Practical#3: DNA gel, bead purification, Qubit, + Lab report briefing (pre-recorded) (CJH, CCL)	**18.** CA1 + L6: Plant microbiome (CJH)
	RECESS WEEK: 20/09 – 28/09		
7.			**02.** L7: Introduction to biofilms (CJH)
8.	**Oct**	**06.** Practical#4: Biofilm hunting, set up biofilm assay + 16S analyses tutorial#1 (pre-recorded) (CJH, CCL, PCW)	**09.** L8: Interspecies interactions (CJH) *** Group Ppt due 12Oct @ 2359hrs**
9.			**16.** Biofilm quantification + 16S analyses tutorial#2a (student's data) (CJH, PCW, CCL)
10.		**20.** Deepavali Holiday	**23.** CA2 + 16S analyses tutorial#2b (student's data) (CJH, PCW, CCL)
11.			**30.** L9: Microbiome & Biofilm Opportunities (Part1) (CJH) *smart casual
12.	**Nov**	**03.** Practical#6: 16S analyses tutorial #3 (CJH, PCW, CCL)	**06.** L10: Microbiome & Biofilm Opportunities (Part2) (CJH) *smart casual
13.		**11. Lab Reports due 11Nov @ 1200hrs**	**13.** L11: Consolidation & Conclusion (CJH)
	READING WEEK: 15/11 – 21/11		
	EXAMINATION: 100% CA		
	VACATION: 07/12 – 11/01/2026		

Mode of Assessment:
15%: Individual Assignment (Product Review + Business Pitch)
30%: CA1 (Microbiomes)
20%: CA2 (Biofilms)
35%: Lab Report: 10% grp video (design & rationale) + 25% indv report (results & discussions)

Lecturers:	**Instructors/TAs:**
Ch'ng Jun Hong (CJH) (micchn@nus.edu.sg) Png Chin Wen (PCW) (micpcw@nus.edu.sg) Chan Chuu Ling (CCL) (micccl@nus.edu.sg)	