(3 credits)

001-2-5062

Weekly Lecture Hours	Exercise	Laboratory	Field Trip
3			

Abstract
Through billions of years, microbial cell-to-cell and cell-to-surface interactions have evolved into a complex microbial entity, referred to as biofilm. A biofilm is defined as a sessile assemblage of complex microbial communities, which are permanently attached to a surface and held together within a matrix of predominantly self-produced, extracellular polymeric substances, EPS. The Mature biofilm complex was documented as microbial micro-colonies separated from each other by interstitial water channels. This unique porous architecture allows transport of nutrients, oxygen, genes, cell lysis and quorum sensing systems involving numerous types of signaling molecules. However, once established, biofilms are notoriously resistant to removal by different treatments, resulting in adverse effects in natural enviroments and engineered sytems.

Course description	The course will discuss in details the biofilm cycle: from bacterial attachment, through community growth and architecture to cell detachment. Further, the course will cover the role of microbial sociology in bacterial metabolism, various survival strategies, and current approaches that are being applied to remove or utilize biofilms.
Course aim	The main objective of the course is to provide the students with a solid background on bacterial community processes that can be linked to applied microbiology.
Course content	The lectures will be divided to the following topics: Introduction to microbiology: bacterial cell structure, metabolic pathways, motility. Background on bacterial biofilms: from the environment to water treatment. The biofilm EPS matrix. Surface chemistry and Physicochemical cell attachment. Quorum-sensing by gram positive bacteria. Quorum-sensing by gram negative bacteria. Metabolism and growth by planktonic bacteria and biofilms

	Biofilm architecture on artificial and natural surfaces. Leaving in the flow: the characteristics of biofilm streamers. 10. Programmed cell death and biofilm dispersal. 11. Biofilm and biofouling in the water industry. 12. Controlling biofilm and biofouling.
Learning outcomes	At the end of the course students will be able to: Describe the physicochemical conditions that determine bacterial cell attachments to various surfaces. Define the bacterial signals that promote biofilm formation, growth and detachment. Characterize 3D architecture of biofilm under various flow regimes and role in resistant against various treatments. Distinguish between different strategies that are currently applied to remove biofilm
Attendance requirements	80 %
Teaching arrangements	Frontal lectures
Required Reading	Provided during the course
Course/module Evaluation	Final exam
Prerequisites	Introduction to microbiology
Lecturer	Edo Bar-Zeev, barzeeve@bgu.ac.il