



Micro-informatics

A bio-informatics course
for microbiologists

*How to characterize the structure,
function, and dynamics of microbial
communities*

The course aims at introducing young microbiologist to the basic tools, methodologies and knowledge required to start being engaged in the structure and functional characterization of microbiota and microbial genomic studies. The course will allow the attendees to:

- Properly design an **experimental plan** to study the **microbiota**, from cohort definition to preanalytical data;
- Acquire key **statistical tools**;
- Acquire key concepts in **metagenomics**;
- Acquire key concepts in **microbial whole genome sequencing** and its applications;
- Learn the **principles of transcriptomic experiments** and data analysis;
- Acquire key concepts in **microbial proteomics and metaproteomics**.

Scientific Committee:

Giovanni Delogu

Vincenzo Di Pilato, Valerio Iebba, Nicasio Mancini

Francesco Santoro, Sergio Uzzau

The course is organized in five units, as outlined in the next page, each to be completed in a one-day session lasting 4 hours followed by self-learning sessions, tasks and exercises to be completed in the next two weeks.

Date	Topic	Speakers
Unit 1 07/03/2024	Introduction to the course: Main lecture on omics in microbiology: basic principles and applications Key methodological and preanalytical issues. Rationale and critical issues on experimental planning. Statistical tools.	Prof. Nicasio Mancini Università dell'Insubria, Varese Prof. Nicola Clementi , Università Vita-Salute San Raffaele, Milano Dr. Flavio De Maio , Fondazione Policlinico Gemelli, Roma
Unit 2 21/03/2024	Genomics From sequencing reads to complete genome: overview of specific tools for quality control of short/long reads, genome assembly and annotation. Focus on genome comparison, phylogenomics, use of genomic data to investigate genetic elements, virulence factors and antibiotic resistance.	Prof. Vincenzo Di Pilato Università di Genova Prof. Marco M. D'Andrea , Università di Roma Tor Vergata, Roma Prof.ssa Simona Pollini , Università di Firenze, Firenze
Unit 3 04/04/2024	Metagenomics Gold standards in 16S and WGS analysis of microbiota, main differences and associated challenges. Focus on how to use metagenomics for the study of specific human body districts and acquisition of the conceptual and practical tools to study microbiota (systems biology, biodiversity, biological and functional markers).	Prof. Valerio Iebba , Università di Trieste Dr. Irene Soffritti , Università di Ferrara Prof. Maria Santagati , Università di Catania
Unit 4 18/04/2024	Transcriptomics Overview of the sequencing technologies for transcriptomic analysis; alignment of reads to the reference bacterial genome and transcripts counts; differential gene expression analysis; analysis of the pathways; principles of dual-RNA sequencing.	Prof. Francesco Santoro , Università di Siena Dr. Lorenzo Colombini , Università di Siena. Prof. Viviana Cafiso , Università di Catania
Unit 5 09/05/2024	Microbial proteomics and metaproteomics. Peptide and protein identification from tandem mass spectrometry data; generation of custom sequence databases for analysis of isolated microbes or microbial communities; taxonomic and functional annotation of metaproteomics data; aggregation of taxonomic and functional data; differential analysis between groups.	Prof. Sergio Uzzau , Università di Sassari Dr. Alessandro Tanca , Azienda Ospedaliero Universitaria di Sassari

Information

Fees: Accepted applicants must register to the course by paying a fee of € 200+VAT.

Applications shall be submitted through the SIM web site using the dedicated application form.
Applications will open **on December 1st, 2023, and will close on January 20th, 2024.**

Attendees: The course will enroll 30 students that will be selected by the Scientific Committee.



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SCHOOL**
IN MICROBIOLOGY
AND HOST MICROBE
INTERACTION