

P000113, Multi-omics analyses of the microbial community, 3.0 Hp

Syllabus

Finalized by: Finalized by: Martyn Fütter, 2024-12-12, 2024-12-12

Level within study regulation:

Third cycle

Grading scale:

Pass / Failed

Course language:

Swedish

Entry requirements:

Enrolled in doctoral education in a relevant subject.

Objectives:

Aims of this course:

- Familiarize the participants with different high throughput omics methods including metagenomics, metatranscriptomics, single cell genomics and transcriptomics
- Discuss how these methods can be efficiently integrated in a multi-omics study for answering our biological questions
- Introduce participants to different approaches for analyzing multi-omics datasets
- Discuss advantages and disadvantages of different multi-omics integration designs and analyses approaches in addressing aims and objectives of different studies
- Focus on gene annotation as a key for integrating different omics methods

- Use gene-based perspective to combine different omics methods and identify the challenges
- Improve participant critical thinking in designing experiments and sampling campaigns employing a combination of different omics approaches
- improve participants understanding of the limitations of integrating different omics approaches
- enable student to design their own studies by integrating appropriate omics methods
- enable student to design their analyses steps to answer their biological questions

Corresponding Learning Outcomes:

- Define different high throughput omics methods
- Understand the potential and limitations of different high throughput omics methods
- Integrate different omics methods in an effective way to answer their own biological question
- Summaries different annotation tools and databases and understand their advantages and disadvantages
- Understand analyses steps for metagenomes
- Understand analyses steps for metatranscriptomes
- Understand analyses steps for single cell genomics
- List limitations of each omics method

Content:

The course will include a mix of synchronous lectures, interactive activities in smaller groups, hands-on data analyses sessions, and asynchronous sessions in form of flipped classroom and literature review plus demonstration laboratory aspects.

The course design will enable participants to follow the course material at their own pace and to discuss among peers in order to deepen their understanding of the topic and the methods.

Week 1 will contain active teaching sessions followed by extensive and directed literature review and preparatory exercises for the rest of the week. Instructors will be available for questions and guidance.

Week 2 will contain active teaching and exercises every day of the week.

Modes of assessment:

The grading scale **pass/fail** will be used for this course. The course examination will be based on attendance and active participation in discussion sessions. Students will be

requested at the beginning of the course to prepare a short presentation about how they will or plan to use environmental omics or multi-omics methods in their thesis work and what are their questions/concerns regarding integrating these methods in their research. We will revisit this at the end of the course and update their plans and assess its feasibility based on what they have learned in the course. In another course activity students will be presented with a research question/hypothesis. They will then be divided in groups of 2 students and discuss how they will address this question/hypothesis by applying multi-omics approach, they will also design the analysis steps and envisioned results in a two page written proposal.

- If a student has failed an examination, the examiner has the right to issue supplementary assignments. This applies if it is possible and there are grounds to do so.

- The examiner can provide an adapted assessment to students entitled to study support for students with disabilities following a decision by the university. Examiners may also issue an adapted examination or provide an alternative way for the students to take the exam.
- If this syllabus is withdrawn, SLU may introduce transitional provisions for examining students admitted based on this syllabus and who have not yet passed the course.
- For the assessment of an independent project (degree project), the examiner may also allow a student to add supplemental information after the deadline for submission. Read more in the Education Planning and Administration Handbook.

Organisation:

Department of Aquatic Science and Assessment

Supplementary information

Other information:

- The right to participate in teaching and/or supervision only applies for the course instance the student was admitted to and registered on.
- If there are special reasons, students are entitled to participate in components with compulsory attendance when the course is given again. Read more in the Education Planning and Administration Handbook.