

Molecular Biology: Concepts and Methods (0000160)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0

Study time 120 h

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)

English

Incheon

lecture

practical

Lecturers in academic year 2024-2025

Radwanska, Magdalena

KR01

lecturer-in-charge

Park, Dongik

KR01

co-lecturer

Offered in the following programmes in 2024-2025

[Bachelor of Science in Environmental Technology](#)

crdts

4

offering

A

[Bachelor of Science in Food Technology](#)

4

A

[Bachelor of Science in Molecular Biotechnology](#)

4

A

[Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology](#)

4

A

Teaching languages

English

Keywords

Replication, DNA repair, transcription, translation, Prokaryota, DNA/ RNA purification, polymerase chain reaction (PCR), restriction enzymes, DNA electrophoresis, hybridization, cloning in Prokaryotic vectors, Sanger sequencing and Next Generation Sequencing, Sequence Alignment, and Databases

Position of the course

This course explains the function and structure of DNA, RNA, and prokaryotic genomes. The course describes molecular mechanisms underlying processes such as replication, transcription, translation, gene regulation and editing occurring in Prokaryota. The course also introduces approaches, techniques, and tools used in modern molecular biology such as DNA amplification, cloning, and sequencing.

Contents

- 1 Structure of nucleic acids, and genomes in Prokaryota.
- 2 Molecular mechanisms and principles of replication, DNA repair and recombination, transcription, translation, gene regulation and editing in Prokaryota.
- 3 DNA/RNA purification, quantification, PCR based DNA amplification, restriction enzyme digestion, DNA electrophoresis, hybridization, Sanger sequencing, Next Generation Sequencing.
- 4 Cloning and expression using prokaryotic vectors.
- 5 Screening of expression libraries.
- 6 Basic bioinformatics analyses such as sequence alignment and database searches.

Initial competences

Basic knowledge and understanding of the structure and function of the genetic material and proteins are required as well as cellular and microbial function. These competences are acquired in the courses such as General Biology, Microbiology,

Final competences

- 1 Understand molecular processes such as replication, transcription, translation, gene regulation and editing occurring in Prokaryota.
- 2 Be aware about various molecular biological techniques and know when and how to apply a certain analytic method while dealing with nucleic acids.
- 3 Conduct basic experiments such as PCR, DNA electrophoresis, restriction enzyme digestion, and cloning.
- 4 Have knowledge about applications of molecular biological analysis in biotechnology.
- 5 Understand basic principles of bioinformatics and be able to conduct sequence alignment and use various databases.
- 6 Critically assess scientific concepts in the field of molecular biology.
- 7 Be aware of public debates surrounding genetic analysis of genomes, cloning, and various applications in biotechnology.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, Practical

Study material

None

References

From Genes to Genomes. Concepts and applications of DNA technology. Eds. Jeremy W. Dale, Malcolm von Schantz & Nick Plant, Wiley-Blackwell 2012,
Gene Cloning and DNA Analysis. T.A. Brown, sixth edition, Wiley-Blackwell 2010.
Molecular Biology of the Cell. B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter. Garland Science, New York.
Brock Biology of Microorganisms. Madigan et al, Fourteenth Edition, Pearson.

Course content-related study coaching

Practical courses are designed to directly support the molecular biology principles outlined in the lectures. The latter contain wrap-up and feedback sessions. This, in turn facilitates study coaching.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with open-ended questions, Assignment

Examination methods in case of periodic assessment during the second examination period

Written assessment with open-ended questions, Assignment

Examination methods in case of permanent assessment

Participation, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

Participation in the practical courses is mandatory. Absence from practical courses without a legitimate reason will result in an 'Absence' score on the final exam. The final exam will have open questions that directly relate to the lectures and experiments performed during practical courses.

Calculation of the examination mark

Written examination with open questions related to the lecture course material and practical courses – 80%
Mid-term written examination will evaluate study progress – 10%
Practical course report – 10%

Facilities for Working Students

Study rooms are available for students.