Course Unit Descriptor

Study Programme: MSc in Biology

Course Unit Title: Molecular Diagnostics

Course Unit Code: MB33

Name of Lecturer(s): Associate Professor Željko D. Popović

Type and Level of Studies: Master of Science, Second cycle

Course Status (compulsory/elective): Elective

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 7

Prerequisites: Biochemistry, Molecular Biology, Genetics or similar

Course Aims:

Aim of this course is to introduce students with a fast growing and developing field of Molecular Diagnostics. The scope of the Course is not only to introduce students to new emerging methods and techniques in molecular diagnostics, but also to inform them about the proper spatial and temporal organisation of diagnostics lab, all necessary equipment, personnel requirements as well as other guides provided in the Good Laboratory Practice (GLP) recommendations of the World Health Organization and other international relevant institutions.

Learning Outcomes:

After completing the Course, students should become familiar (1) with the principles of good organisation and management of molecular diagnostics lab, (2) necessary equipment and microclimate conditions it requires, (3), a wide variety of other principles of the GLP, as well as how to (4) establish new molecular diagnostic test in the lab, (5) generate reliable and accurate results, (6) to issue results to patients and (7) clarify patient results, if necessary. Students should be able to use their knowledge not only in the wide laboratory setting, but also in their everyday life.

Syllabus:

Theory

(1) Introduction. Brief history of Molecular Diagnostics. Standards of GLP. (2) Types of biological specimens. (3) Methods of nucleic acid extraction in Molecular Diagnostics. (4) Classical PCR. (5) Real-time PCR. (6) Other types of PCR in diagnostics. (7) Hybridisation techniques. (8) Sequencing (NGS) in diagnostics. (9) Bioinformatics in diagnostics. (10) Antibody based techniques in diagnostics. (11) Metabolomics and other -omics in molecular diagnostics. (12) Molecular diagnostics in microbiology. (13) Molecular diagnostics of genetic disorders. (14) Prenatal molecular diagnostics. (15) Detection of GMO.

Practice

During the practical part of the course, students are thought how to work in molecular diagnostics lab: (1) how to take appropriate measures of precaution to avoid to be infected, (2) to contaminate or cross contaminate samples during workflow, (3) to perform preparation of biological samples, (4) perform molecular analyses, (5) understand and issue generated results, as well as (6) to give advice to patients, upon request. In addition to compulsory exercises, visits to reference molecular clinical laboratories are provided in order to familiarise students with the way they work and how they are organised.

Required Reading:

1. Editor(s): George P. Patrinos,Molecular Diagnostics (Third Edition),Academic Press,2017, ISBN 9780128029718,
2. Lela Buckingham Molecular Diagnostics: Fundamentals, Methods and Clinical Applications - 2nd edition, F. A. Davis Co, 2011, ISBN 13: 9780803626775
3. Iljoen, G.J, Nel, L.H, and Crowther, J.R. (2005) Molecular Diagnostics PCR Handbook. Springer. Netherlands. ISBN-13 978-1-4020-3404-6

Weekly Contact Hours: 4	**Lectures:** 2	**Practical work:** 2

Teaching Methods:

Lectures and students practical work.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation		written exam	50
Practical work	30	oral exam	20