

| Course code | Course group | Volume in ECTS credits | Course hours |
|-------------|--------------|------------------------|--------------|
| BIO5009     | C            | 6                      | 160          |

|                                      |              |
|--------------------------------------|--------------|
| Course type (compulsory or optional) | Compulsory   |
| Course level (study cycle)           | MA Courses   |
| Semester the course is delivered     | Autumn       |
| Study form (face-to-face or distant) | Face-to-face |

#### Course title in Lithuanian

**MOLEKULINĖ LABORATORINĖ DIAGNOSTIKA**

#### Course title in English

**MOLECULAR LABORATORY DIAGNOSTICS**

#### Short course annotation in Lithuanian

Molekulinės laboratorijos kursas nagrinėja susistemintas žinias apie biologijos, molekulinės biologijos ir laboratorinės diagnostikos sąsajas, pateikiant naujausius šių mokslų pasiekimus ir pritaikymus molekulinės laboratorinės diagnostikos praktikoje. Studentams pateikiami geros laboratorinės ir klinikinės praktikos darbo principai; kokybės kontrolės reikšmė, molekulinės laboratorijos metodų apžvalga ir jų taikymas genetinių ligų, infekcinių ir lytiškai plintančių ligų, onkologinių susirgimų diagnostikai bei asmenų identifikacijai.

#### Short course annotation in English

The aim of this course is to present students to the practice of biology and molecular biology and its applications in the clinical laboratory and molecular laboratory. The topics include good laboratory practice, introduction to internal and external laboratory quality control; laboratory design; diagnostic tests infectious diseases, forensic science, oncology, paternity, transplantation and cytogenetics, and molecular diagnostic tests for nucleic acid targets found in a variety of settings in medicine, genetics, infectious disease, hematopathology.

#### Prerequisites for entering the course

Cell Biology. Biochemistry. General immunology. General genetics.

#### Course aim

The aim of the course is to provide high-knowledge:  
in the molecular biology techniques, their principles and application for research and diagnostic laboratory;  
in the molecular laboratory diagnostics, which is responsible for the development and performance of molecular diagnostic tests for nucleic acid targets found in a variety of settings in medicine.

#### Links between course outcomes and criteria of learning achievement evaluation

| Course outcomes | Criteria of learning achievement evaluation |
|-----------------|---|
|-----------------|---|

|  |  |
|--|--|
| Know and understand the principles of working with biological material in laboratory.  | Know and understand GLP the basic rules and cited.<br>Understand importance of laboratory examinations, quality control system. Know peculiarity of molecular diagnostic laboratory.   |
| Know the molecular methods, mechanisms and principles and their application possibilities for diagnostic and medical purposes.   | Perception of the mechanisms of biological processes, molecular testing methods. Know the nature of the genetic material. Will be able to choose the most suitable and effective methods for tests, will be able to analyze the results. Is able to see the advantages of methods and applications perspectives  |
| Understand the importance of molecular diagnostics laboratory at the level of modern medicine. Know and self introduce how to identify disease pathogens with modern molecular biology techniques. | Know the modern molecular technology achievements and importance. Will be able to understand and choose tests for inherited diseases, oncological diseases, infectious diseases, sexually transmitted diseases, identity testing and other diseases. Will be able to evaluate the use of molecular tests cost-effectiveness and the need for diagnostic  |
| Know how to choose an effective research methods, tools and equipment. Be able to formulate and solve actual researches or technical problem.  | Be able to classify laboratory diagnostic tests, explain the basic method selection criteria and principles. Be able to do results analysis and interpretation. Be able to use the knowledge and put into practice. Will be able to choose an effective method, tools and equipment for solving molecular research problem. Know to plan and organize scientific experiments and laboratory tests. Will take skills in written and oral communication, information search, selection, generalization, and archiving. |

### Content (topics)

|   |
|---|
| 1. Principles of Good Laboratory Practice.  |
| 2. Quality system in the clinical diagnostic laboratory.  |
| 3. Requirements for good laboratory practice in molecular diagnostic laboratory.  |
| 4. Clinical laboratory examinations groups and their importance for disease diagnosis and treatment.                                    |
| 5. The power of molecular biological techniques. Molecular laboratory methods review (I), application to diagnostic molecular medicine. |
| 6. Molecular laboratory methods review (II), their application in diagnostics, application to diagnostic molecular medicine.            |
| 7. The diagnosis of hereditary genetic disorders: chromosomal diseases.   |
| 8. The molecular laboratory examinations of hereditary genetic disorders:   |
| 9. Infectious disease diagnostic laboratory principles.   |
| 10. The diagnostic methods for Sexually Transmitted Infections.   |
| 11. Human identity testing in medical and forensic laboratories by using STR molecular markers.   |
|   |

|   |
|---|
| <p><b>Practical work (contents):</b></p> <ol style="list-style-type: none"> <li>1. Inflammatory process indicators: C-Reactive Protein, erythrocyte sedimentation rate, methods, clinical interpretation.</li> <li>2. Rapid and point-of-care screening tests from blood and urine. Accuracy of rapid tests.</li> <li>3. Methods for NA purification from different biological sources. Their advantages and disadvantages.</li> <li>4. Methods for DNA purity and concentration detection.</li> <li>5. <b>Amplification and quantification of DNA. PCR principles, optimization and procedure. PCR in diagnosis of diseases.</b></li> <li>6. Amplified product visualization techniques and principles.</li> </ol> |
| <p><b>Distribution of workload for students (contact and independent work hours)</b></p>  |
| <p>Lectures – 45 hours, practical work – 15 hours, individual work – 97 hours, exam – 3 hours.</p>  |

### Structure of cumulative score and value of its constituent parts

|   |
|---|
| <p>Final assessment sums the assessments of written final examination (50%), written mid-term examination (30%) and assessment of laboratory works (20%).</p> |
|---|

### Recommended reference materials

| Nr.                    | Publication year | Authors of publication and title   | Publishing hours                 | Number of copies in |                  |                 |
|------------------------|------------------|--|----------------------------------|---------------------|------------------|-----------------|
|                        |                  |  |                                  | University library  | Self-study rooms | Other libraries |
| <b>Basic materials</b> |                  |  |                                  |                     |                  |                 |
| 1.                     | 2006             | Diagnostic techniques in Genetics. Edited by J.-L. Serre.  | John Wiley & Sons, Ltd., 256 p.  |                     |                  |                 |
| 2.                     | 2003             | Bartlett JMS and Stirling D, editors PCR Protocols, 2nd ed. Methods in Molecular Biology. Vol. 226 | New Jersey: Humana Press. 128 p. |                     |                  |                 |
| 3.                     | 2008             | Kučinskienė Z. Klinikinės biochemijos ir laboratorinės diagnostikos pagrindai.                     | Vilnius: VU, 410 p.              |                     |                  |                 |
| 4.                     | 2008             | D. Ambrasienė. Molekulinės   | Kaunas: VDU, 161 p.              | 20 egz.             |                  |                 |

|    |      |  |                                      |  |  |  |
|----|------|--|--------------------------------------|--|--|--|
|    |      | biologijos praktikumas: mokymo priemonė.   |                                      |  |  |  |
| 5. | 2008 | Molecular Diagnostics in Hematology Oncology. St. Stilgenbauer, H. Dohner. 1st edition                     | Bremen: UNI-MED, 128 p.              |  |  |  |
| 6. | 2009 | Firantienė R., Sasnauskienė S., Ėmužytė R. Polimerazės grandininės reakcijos diagnostinio metodo ypatumai. | Laboratorinė medicina; 1(41): 43-50. |  |  |  |

| <b>Other materials</b> |            |  |   |  |  |  |
|------------------------|------------|--|---|--|--|--|
| 1.                     | 2008       | E. Dagytė. Chromosominių ligų laboratoriniai tyrimai.  |   |  |  |  |
| 2.                     | 2008       | L. Cimbališienė. Pveldimos medžiagų apykaitos ligos Vilnius: VU, 2008, 272 p.                    | L. Cimbališienė. Pveldimos medžiagų apykaitos ligos Vilnius: VU, 2008, 272 p. |  |  |  |
| 3.                     |            | Kučinskienė Z. Laboratorinė medicina   | Internetas  |  |  |  |
| 4.                     | 1999       | Jurgelevičius V., Steponavičiūtė D. Polimerazės grandininė reakcija: principai ir taikymo sritys | Laboratorinė medicina, nr.3, p.28-34.   |  |  |  |
| 5.                     | 2003; 2011 | G. Zaleckis. Pagrindinių laboratorinių tyrimų žinynas  | Vaistų žinios, 2011, 592 p  |  |  |  |

|    |  |  |   |  |  |  |
|----|--|--|---|--|--|--|
| 6. |  | LR Sveikatos apsaugos ministro įsakymas 1999 m. balandžio 12 d. Nr.155 „Dėl geros laboratorinės praktikos (GLP) taisyklių neklinikinių (eksperimentinių) laboratorijų tyrimams | Internetas<br><a href="http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_1?p_id=78626">http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_1?p_id=78626</a> |  |  |  |
|----|--|--|---|--|--|--|

**Course programme designed by**

|  |
|--|
| Doc. D. Ambrasienė, Prof. A.Paulauskas, Faculty of Natural Sciences, Department of Biology |
|--|