COURSE: MOLECULAR PHYSIOPATHOLOGY

SUBJECT MATTER: Biotechnology for Health
MODULE: Optional Subjects
PROGRAM: Degree in Biotechnology

GENERAL FEATURES *
Type: ☐ Basic training, ☐ Compulsory, ☑ Elective
☐ Final Degree Project, ☐ Practicum
Duration: Semestral Semester / s: 7
Number of ECTS credits: 5
Language / s: English

DESCRIPTION

SHORT DESCRIPTION AND JUSTIFICATION (of the meaning of the course in relation to the studies. Between 100 and 200 words)

The advance in the knowledge of molecular mechanisms of disease have driven the field of molecular physiopathology.

Molecular physiopathology includes the study of the molecular mechanisms of disease and interfaces with translational medicine where new basic science discoveries frame the basis for the development of disease prevention, new targeted therapies and new diagnostic tools.

This course will be valuable for students that desire to advance their understanding of molecular mechanisms of disease providing a broad coverage of the essential concepts related to the molecular basis of major human diseases. The course plan covers the essentials of molecular mechanisms like cell death or inflammatory response together with the role of genomics, transcriptomics and epigenomics in the understanding of human diseases. Also, we have assembled in the programme the study the molecular basis and mechanisms of major human diseases and disease processes, presented in the context of traditional pathology, with implications for translational molecular biomedicine.

COMPETENCES (of the course placed in relation to the pre-assigned competences in the subject matter)

- That students develop those learning skills necessary to undertake further studies with a high degree of autonomy. (CB5)
- Be able to assess the impact of their professional activity on the sustainable development of society. (T3)
- Be able to incorporate contemporary aspects related to the exercise of their profession. (T5)
- Be able to understand and apply advanced knowledge of Biosciences and Engineering to the field of Biotechnology. (E3)

* These features should not be modified without the approval of the academic board (subject matter, module and / or studies program).
• Be able to integrate the knowledge and tools of biotechnology for their application to different industrial sectors that use, develop or produce biotechnological products or processes. (E6)

PREVIOUS REQUIREMENTS * (modules, subject matters, courses or knowledge necessary for the follow-up of the subject. State previous courses required to be completed)

The competences of the previous educational stages

CONTENTS (List the content of the course, with up to two level detail)

The syllabus of the module “Molecular Physiopathology” contains the following topics:

1. Essentials in molecular physiopathology - Mechanisms of disease
   1.1. Molecular mechanisms of cell death
   1.2. Disease pathogenesis and acute and chronic Inflammation
   1.3. Infection and host response
   1.4. Cancer

2. Concepts in molecular biology and genetics
   2.1. Human molecular genetics
   2.2. The human genome and the understanding of diseases
   2.3. Human transcriptomics and its implications in pathology
   2.4. Epigenomics and human disease
   2.5. Proteomics and molecular pathology
   2.6. Integrative Systems Biology: Understanding of human disease

3. Principles of Molecular Physiopathology
   3.1. The clinical description of human disease terms, definitions, and concepts
   3.2. Cardiovascular disease
   3.3. Hemostatic, thrombotic and lymphoproliferative diseases
   3.4. Immunological diseases
   3.5. Pulmonary disease
   3.6. Diseases of the gastrointestinal tract
   3.7. Disorders of liver and biliary function
   3.8. Diseases of the endocrine system
   3.9. Prostate diseases
   3.10. Skin disease
   3.11. Neuropathology
   3.12. Gynecologic diseases

4. Practice of Molecular Medicine
   4.1. Molecular diagnosis of human disease
   4.2. Molecular assessment of human disease in the clinical laboratory
   4.3. Understanding molecular pathogenesis: Implications for improved treatment of disease

* These features should not be modified without the approval of the academic board (subject matter, module and / or studies program).
**LEARNING ACTIVITIES * (Complete the table relating activities, workload in ECTS credits, and competences.)**

<table>
<thead>
<tr>
<th>Learning Activities</th>
<th>ECTS Credits</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1,3</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td>Case and Problem-Solving Sessions</td>
<td>0,1</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td>Seminars</td>
<td>0,1</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td>Practical and Lab Work</td>
<td>-</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td>Presentations</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Personal Study</td>
<td>3,3</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td>Assessment Tasks (Exams, Continuous Assessment...)</td>
<td>0,2</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>5,0</strong></td>
<td><strong>B5,T3,T5,E3,E6</strong></td>
</tr>
</tbody>
</table>

**TEACHING METHODOLOGY** (justify the teaching methodology in relation to the competences and course contents. Between 100 and 200 words)

It is based on the following aspects:
- Exhibition of contents through presentation or explanation by a teacher.
- Resolution of exercises, approach / resolution of problems and exposure / discussion of cases by a teacher with the active participation of students.
- Period of instruction carried out by a teacher with the aim of reviewing, discussing and resolving doubts about the materials and topics presented in the sessions of exposition of concepts and sessions of resolution of exercises, problems and cases.
- Personal work of the student necessary to acquire the competences of each topic and assimilate the knowledge exposed in the sessions of exposition of concepts and sessions of resolution of exercises, problems and cases, using, when necessary, the recommended material for consultation. They also include the preparation of tasks (e.g. summaries of topics) related to the other activities, and the preparation of exams.
- Written tests carried out during the academic period of the subject or once it has finished (final exam, follow-up activities). Students will receive questionnaires during the course related to the topics discussed in class that as follow-up activities must meet according to delivery time.

* These features should not be modified without the approval of the academic board (subject matter, module and / or studies program).
ASSESSMENT

ASSESSMENT METHODS * (Complete the table relating assessment methods, competences, and weight percentage in the course qualification)

<table>
<thead>
<tr>
<th>Assessment methods</th>
<th>Weight</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>70%</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td>Midterm Exam/s</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Continuous Assessment Activities</td>
<td>25%</td>
<td>B5,T3,T5,E3,E6</td>
</tr>
<tr>
<td>Presentations</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Lab or Field Work</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Projects</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Host Student Evaluation</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td>5%</td>
<td>B5,T5,T3,E3,E6</td>
</tr>
</tbody>
</table>

LEARNING OUTCOMES (Explanation of the student's achievements that allow the assessment of competences, relating them to the competences and the assessment methods)

- The student must develop with a high degree of autonomy necessary learning skills to continue with the subjects of biosciences and engineering with implications in the field of health sciences. The student must demonstrate that they know the fundamental aspects of the molecular bases in physiopathology and their involvement in biomedicine (B5 and T3).

- The student must be able to understand these molecular bases of physiopathology and integrate them to the previous knowledge acquired in the field of Biotechnology (E3).

- The student must be able to incorporate aspects related to the course to the future exercise of their profession (T5,T3 and E6)

QUALIFICATION (Explanation of the qualification system)

The final grade (FG) of the course will consider the qualifications of the follow-up activities (FA), the participation (P) and the final exam (FE).

The qualification of the follow-up activities (FA, 25% of the final grade) will be calculated as a simple average of the activities carried out (eg, resolution of questionnaires, delivery of subject summaries).

The qualification of the participation (P, 5% of the final grade) will be decided by the teacher at the end of the course taking into account the degree of participation of the student during the overall activities of the course.

* These features should not be modified without the approval of the academic board (subject matter, module and / or studies program).
The final exam (FE, 70% of the final grade) aims to assess the synthesis of the subject (A minimum grade point average of 3.5 / 10 must be obtained in the final exam. In the case that the minimum grade is not reached the final grade of the course will be below 4.)

The final grade (FG) of the subject will be calculated with the following formula:

\[ FG = 0.7 \text{ FE} + 0.25 \text{ FA} + 0.05 \ P \]

**ASSESSMENT OF THE COMPETENCES** (Describe the grading system for each competence in relation with the assessment tasks)

For the evaluation of the B5 competence, the final grade for the subject will be used as an indicator. For the evaluation of the E3 and T5 competences, the indicator used will be the AS score and the final exam grade. For the evaluation of the E6 competence, the final exam grade will be used as an indicator.

**BIBLIOGRAPHY** (Recommended and accessible to the student.)

- Principles of Molecular Pathology, AA Killeen . (2004)

**DOCUMENT HISTORY**

**PREVIOUS REVISIONS** (Indicate date and author / s, first the most recent one)
- May 2nd 2018, Dr. Marcel·lí Carbó
- June 29th 2017, Dr. Marcel·lí Carbó
- April 6th 2016, Dr. Marcel·lí Carbó

**CURRENT REVISION** (Indicate date and author / s)
- March 11th 2019, Dr. Marcel·lí Carbó

* These features should not be modified without the approval of the academic board (subject matter, module and / or studies program).