COURSE: IMMUNOLOGY

SUBJECT MATTER: Immunology & Pharmacology
MODULE: Biotechnology for Health
PROGRAM: Degree in Biotechnology

GENERAL FEATURES *
Type: ☐ Basic training, ☑ Compulsory, ☐ Elective
☐ Final Degree Project, ☐ Practicum
Duration: Semestral  Semester / s: 6
Number of ECTS credits: 4
Language / s: Spanish, Catalan, English

DESCRIPTION

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

The subject of Immunology aims to establish the basic immunological foundations necessary for the student to apply them in the field of biotechnology. The theme consists of seven chapters: Basic Concepts of Immunology, Innate Immunity, Adaptive Immunity, Adaptive Response, Immune Response in Health and Disease, Diagnostic Applications of Immunology and Therapeutic Applications of Immunology.

Immunology is a science with innumerable applications in research, healthcare and industry. It is in continuous expansion and is also widely interdisciplinary, where chemists, doctors, biologists and chemical engineers have a great role. Therefore, students of the degree of biotechnology must know the bases of immunity at a level comparable to other basic sciences, enabling them to apply it with responsibility in the exercise of their profession.

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

- That students know how to apply their knowledge to their work or vocation in a professional manner, and have acquired the competencies that allow them to elaborate and defence arguments as well as to solve problems within their area of study. (CB2)
- 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 understand and apply advanced knowledge of Biosciences and Engineering to the field of Biotechnology. (E3)
- Be able to use tools, systems or processes to carry out the activities in the field of Biotechnology according to the established requirements. (E4)
- 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)

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

It is recommended to have previous knowledge of Biology and Microbiology and own competences of the previous educational stages.

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

1. Basic concepts of Immunology.
   1.1. Introduction to Immunology: basic concepts. Innate and adaptive immunity.
   1.3. Cellular communication Cytokines and chemokines
   1.4. Dynamics and lymphocyte recirculation. Adhesion molecules.

2. Innate immunity.
   2.1. Recognition in the innate response. Pathogen-associated molecular patterns (PAMPs): cellular receptors. TOL-like receptors and cell signaling
   2.4. Inflammatory response. Inflamasoma. Mediators of inflammation.

   3.1. Antigens Antigenic determinants. Immunogenicity and antigenicity. T cell receptors (TCR).
   3.3. Presentation and processing of antigen. Receptors involved in the adaptive response. B cell receptors (BCR).
   3.4. Main Histocompatibility Complex (MHC). Human leukocyte antibodies (HLA).

   4.1. Activation of T lymphocytes
   4.2. Proliferation and differentiation of CD4 and CD8 + T lymphocytes Cytotoxic T cells (Tc) and helper T cells (Th).
   4.3. Effector responses B lymphocytes.
   4.4. Immunological memory Responses mediated by memory B and T cells.
   4.5. Regulation of the immune response. Central and peripheral tolerance. Homeostasis of the immune system. Regulatory response

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5. Immune Response in Health and Disease: Immunopathology
   5.1. Immune response to infections. Inflammatory response. Effector mechanisms against bacteria, viruses, fungi and parasites.
   5.2. Immune response type 1, type 2 and type 3.
   5.4. Immunology of the transplant. Recognition of alloantigen. Types of rejection, effector mechanisms.

6. Diagnostic applications of Immunology.
   6.1. Immunological techniques
   6.2. Exploration of the innate and adaptive response.
   6.3. Application of monoclonal and polyclonal antibodies in diagnostic tests.

7. Therapeutic applications of Immunology.
   7.2. Biological therapies in autoimmune and inflammatory diseases.
   7.3. Antitumor therapy
   7.4. Application of monoclonal antibodies in organ transplantation and prevention of rejection
   7.5. Gene therapy of immunological diseases.

**LEARNING ACTIVITIES**

* (Complete the table relating activities, workload in ECTS credits, and competences.)

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<table>
<thead>
<tr>
<th>Learning Activities</th>
<th>ECTS</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1,3</td>
<td>B2, B5, T3, E3, E4, E6</td>
</tr>
<tr>
<td>Case and Problem-Solving Sessions</td>
<td>0,1</td>
<td>B2, B5, T3, E3, E4, E6</td>
</tr>
<tr>
<td>Seminars</td>
<td>0,1</td>
<td>B2, B5, T3, E3, E4, E6</td>
</tr>
<tr>
<td>Practical and Lab Work</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Presentations</td>
<td>0,1</td>
<td></td>
</tr>
<tr>
<td>Personal Study</td>
<td>2,3</td>
<td>B2, B5, T3, E3, E4, E6</td>
</tr>
<tr>
<td>Assessment Tasks (Exams, Continuous Assessment...)</td>
<td>0,1</td>
<td>B2, B5, T3, E3, E4, E6</td>
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<tr>
<td>TOTAL</td>
<td>4,0</td>
<td>B2, B5, T3, E3, E4, E6</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 activities:

- **Lectures** - Presentation and explanation of contents by a teacher (possibly including demonstrations).
- **Case and Problem-Solving Sessions** - Resolution of exercises and problems, and exposition / discussion of cases by a teacher with the active participation of students.
- **Practical and Lab** - Period where the student performs laboratory activities or similar (computer practices, projects, workshops, etc.) under the direct supervision of a teacher.
- **Presentations** - Oral presentation by a student to a teacher and/or other students. The presentation can be a work prepared by the student through searches in published bibliography, or a summary of a practical work or a project.
- **Personal study activities** - Personal work of the student necessary to acquire the competences of each subject matter, and to assimilate the knowledge exposed in lectures and case and problem-solving sessions, using the recommended reference materials. They also include the preparation of tasks related to the other activities, and the preparation of exams.
- **Assessment Tasks** - Oral and / or written tests made during the academic period of a course, or once it has finished (final exams, follow-up controls).

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>45%</td>
<td>B2, B5, T3, E3, E4, E6</td>
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</tbody>
</table>

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

• Understand how the different mechanisms of the immune response work in an integrated manner (B2, E4)
• Know the molecular bases and the physiology of pathologies produced by abnormalities in the immune response. (B2)
• Understand the main mechanisms of modulation of the immune response and its role in the general homeostasis of the organism. (B2, B5)
• Know and understand the basic fundamentals of clinical analysis in the field of Immunology and its diagnostic value, as well as therapeutic applications. (B2, T3, E3, E6)

QUALIFICATION (Explanation of the qualification system)

The evaluation of the subject will consider the grades of the continuous assessment activities (CAS), works and presentations (TP), participation (P) and of the final exam (EF). Thus, the grade of the subject will be obtained from:
- The continuous assessment activities (CAS)
- Works and presentations (TP).
- Participation (P).
- A final exam (EF). In which all the matter enters.

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The Final Grade (NF) is calculated as follows:

\[ NF = 0.45 \times EF + 0.30 \times CAS + 0.20 \times TP + 0.05 \times P \]

In order to calculate the NF, each of the notes that allow its calculation (EF, EP, TP) must be greater than or equal to 5. If not, the final grade (CF) will be the lowest grade obtained from these four.

In the second call, the final grade will be the following

\[ NF(2) = 0.75 \times EF + 0.15 \times CAS + 0.075 \times TP + 0.025 \times P \]

In the following calls, the final grade will be the exam note, without taking into account the follow-up activities or the papers or presentations.

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

For the evaluation of the competences B2, B5, T3, E3, E4, E6, the final grade of the subject will be used as an indicator.

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


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DOCUMENT HISTORY

PREVIOUS REVISIONS (Indicate date and author/s, first the most recent one)

CURRENT REVISION (Indicate date and author/s)
4 March 2019, Dra. Cristina Fornaguera Puigvert

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