COURSE OUTLINE

1. GENERAL

SCHOOL	APPLIED BIOLOGY AND BIOTECHNOLOGY		
ACADEMIC UNIT	BIOTECHNOLOGY		
LEVEL OF STUDIES	*Undergraduate*		
COURSE CODE	**3500**	**SEMESTER**	6th
COURSE TITLE	IMMUNOLOGY		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
LECTURES/ PRACTICAL EXERCISES	5	
TOTAL ECTS (Table 4)		**5,00**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised general knowledge, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS :	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://oeclass.aua.gr/eclass/modules/auth/courses.php?fc=37

2. LEARNING OUTCOMES

LEARNING OUTCOMES

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course is a basic introductory course on the concepts of Immunology.
This course aims to introduce students to the understanding of the structure and the function of the immune system, emphasizing in mechanisms that activate immune responses.
It refers to basic concepts and methodologies for the study of the maturation and activation of immune cells, antibody production, mechanisms of immune tolerance and immunity in order for the student to gain a complete picture of the functioning of the immune system in physiological and pathological conditions.
Finally, the aim of the course is the understanding of the structure, organization and functioning of the immune system, the complex mechanisms that govern immune responses and diseases associated with dysregulation of the immune system.

Upon successful completion of this course the student will be able to:
• Understand the structure and organization of the immune system.
• Gain full insight into the basic operating principles of the immune system.

- Understand how the innate immune system recognizes and attacks pathogens (self/ non-self recognition) and also interpret the interactions of the innate with the adaptive immunity.
- Gain knowledge of the characteristics of antigens, the structure of antibodies, the sites of antigen binding, the classes and biological actions of antibodies, and the production of monoclonal antibodies.
- Understand the importance of antibody diversity and the mechanisms that induce it, including rearrangements of immunoglobulin genes for the production of the variable region and the process of class switch for the production of different types of antibodies.
- Gain full insight into antigen-presenting mechanisms of endogenous antigens in MHC I molecules via the cytoplasmic pathway and exogenous antigens in MHC II via the intracellular path.
- Gain knowledge of the mechanisms of T cell maturation and differentiation in the thymus through positive and negative selection, as well as of T cell activation in the periphery.
- Understand how B lymphocytes are developed and selected in the bone marrow and how are activated in secondary lymphoid organs to produce plasma cells or memory cells.
- Become familiar with cell communication mechanisms through the production of cytokines by TH1 and TH2 CD4 + T lymphocytes for effective immune response.
- Gain knowledge in cell-mediated immune mechanisms through the recognition of target cells by cytotoxic T cells.
- Understand how immune system eliminates self-reactive B and T clones either before maturation or in the periphery and gain knowledge about the characteristics of the most important autoimmune diseases.
- In the laboratory, he is trained in tools and cutting-edge techniques of Immunology, and collaborates with his fellow students to evaluate the experimental results and adequately present the results and conclusions of the experimental process.
- Assess the applications of technologies in Immunology and propose their choice for specific projects / programs.
- Acquire knowledge of the tools and techniques of immunology in the field of diagnosis and research in order to indulge further by applying them within postgraduate and professional level.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Production of new research ideas*
Adapting to new situations	*Project planning and management*
Decision-making	*Respect for differences and multiculturalism*
Working independently	*Respect for the natural environment*
Team work	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Working in an international environment	*Criticism and self-criticism*
Working in an interdisciplinary environment	*Production of free, creative and inductive thinking*

- Working independently
- Team work
- Decision-making
- Working in an interdisciplinary environment
- Production of new research ideas
- Project planning and management
- Search for, analysis and synthesis of data and information, with the use of the necessary technology

- Production of free, creative and inductive thinking

3. SYLLABUS

1. **Overview of the Immune System**: Historical Review. Infection and Immunity. Innate and adaptive immunity. Humoral and cellular mediated immunity.
2. **Cells and organs of the immune system**: Hematopoiesis. Apoptosis. Immune system cells. Immune system organs.
3. **Innate immunity**: Anatomical barriers. Relationships of innate and adaptive immunity. Inflammation. Soluble molecules and membrane receptors. Toll Receptors. Cellular types of innate immunity. Signaling pathways.
4. **Antigens – Antibodies**: Immunogenicity- Antigenicity. Basic antibody structure. Antibody binding sites. Antibody functions. Family of immunoglobulins. Monoclonal Antibodies.
5. **Organization and expression of immunoglobin genes**: Polygenic organization of immunoglobulin genes. Gene rearrangements of the variable region. Variety of antibodies. Class switch. Expression of membrane and secretory immunoglobulin.
6. **Major histocompatibility complex - antigen processing and presentation**: Organization of the MHC locus. MHC molecules and genes. Cellular MHC expression. The role of antigen-presenting cells. Endogenous antigen - Cytoplasmic route. Exogenous antigen - Intracellular route.
7. **T cell receptor**: Structure and roles of αβ and γδ T cell receptors. Organization and rearrangement of TCR genes. TCR-CD3 complex. CD4 and CD8 co-receptors. TCR-MHC/peptide binding.
8. **Maturation, differentiation, activation of T lymphocytes**: Maturation of T cells in the thymus. Positive and negative selection. Activation of T cells, stimulatory signals. T cell differentiation. Cell death.
9. **Maturation, differentiation, activation of B lymphocytes**: Maturation of B lymphocytes. Activation and proliferation of B lymphocytes. Humoral response. Germinal centers and antigen-induced B cell differentiation.
10. **Cytokines**: Properties of cytokines. Cytokine receptors. Cytokine production from TH1 and TH2 subpopulations. Cytokine therapeutic applications.
11. **Cell-mediated cytotoxic responses**: Effector T cells. Cytotoxic T cells. Destruction of cells by cytotoxic T cells.
12. **Tolerance and autoimmunity, Autoimmune diseases**: Central tolerance. Peripheral tolerance. Organ-specific autoimmune diseases. Systemic autoimmune diseases. Mechanisms of autoimmunity.

Laboratory: Study of Antibody structure and epitope mapping - ELISA method - Histological analysis of lymphoid organs - Western blot - Flow cytometry.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in suitably equipped teaching rooms.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	The course is completely computerised in the form of Powerpoint, Web linking, etc. Computer programs and applications are taught and distributed to students. Course material also made available to the students via the e-class platform.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice,*	

Activity	*Semester workload*
Lectures	39 h
Laboratory practice	16 h

fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc. *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	<table><tr><td>Practical report writing</td><td>6 h</td></tr><tr><td>Independent study</td><td>64 h</td></tr><tr><td>Course total (Total contact hours and training)</td><td>***125 h***</td></tr></table>
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	**I.** Written final examination (50%) of different difficulty, based on the lectures offered, containing: - Questions of multiple choice. - Questions of theoretical knowledge. - Problems based on lecture material. **II.** Laboratory exercises/practicals: Written Examination (35%) of different difficulty, based on the lectures offered, containing: - Questions of multiple choice. - Questions of theoretical knowledge. - Problems based on lecture material. **III.** Group and small autonomous works (15%).

5. ATTACHED BIBLIOGRAPHY

-Suggested bibliography :
-Relevant scientific journals:

Kuby Immunology. Kindt, Goldsby RA, Osborne BA, Kuby J. 6th edition. 2007.
Immunology. Male D, Brostoff D, Roth D, Roitt I. 8th edition, Elsevier. 2013.