Course Title	**Pharmaceutical Biotechnology**				
Course Code	ABS403				
Course Type	Compulsory				
Level	BSc (Level 1)				
Year / Semester	4th / 7th Semester				
Teacher's Name	Dr Despina Charalambous				
ECTS	4	Lectures / week	3+1*	Laboratories/week	
Course Purpose	The course aims to exposing students to various topics in biotechnology, including the role of the pharmacist in biotechnology, criteria for regulatory approval for biotechnology drugs, technology in genetic engineering and its application to pharmacy and tissue culture. Students will also be exposed to methods in producing commercial products using fermentation biotechnology. This course will also discuss the clinical, epidemiological, economical and ethical aspects of the use of biotechnological drugs. More specifically, the aim of this course is to introduce students to the basic ideas of biotechnology, to teach the ways of interference in the genetic mechanisms of cells and of creation of gene libraries. Furthermore, to teach how mutations are made and detected, as well as how proteins can be specifically engineered, and which proteins can be produced by genetic engineering. Other aims are realisation of the benefits of biotechnology for pharmacy and pharmacotherapeutics, production of knock-out animals, transgenic animals, Gene therapy and Pharmacogenetics, tissue and cell (animal, plant) cultures and examination of the human genome for the discovery of new drugs.				
Learning Outcomes	By the end of this course, the students should be able to: • Identify what biotechnology is its basic rules, applications, contribution to society as a whole and to health and pharmacy in particular; • Describe the basics and applications of genetic engineering • Recognise the molecular mechanisms of DNA cloning, methods for creating recombinant DNA molecules and applications for diagnosis and treatment of disease; • Explain what pharmacogenetics/pharmacogenomics is and its applications; • Familiarize with animal research and tissue culture applications; • Recognise the mechanisms of transgenic technology, gene therapy and stem cells as well as their application in pharmacy; • Describe the basics of Bioreactor Technology and the manufacturing of commercial biotechnology products; • List and describe various aapplications of biotechnology in Pharmacy (amino acids, proteins, enzymes, hormones, vitamins, secondary				

	metabolites, antibiotic production, vaccines and monoclonal antibodies production).		
Prerequisites	ABS210	Corequisites	-
Course Content	Theory: Genetic engineering technology (ways of interfering with cellular genetic mechanisms, gene library building, species and mutation detection, recombinant proteins, transgenic animals, protein expression systems, DNA imprinting and sequencing methods) Gene therapy (characteristics and use of tissues and cells, animal and plant cell cultures, methods of DNA transfer, transformation and transfection of cell systems, stem cells). Bioreactor technology (species, characteristics, types of bioreactors, purification and isolation of fermentation products, exploitation of biotechnology advantages) Pharmacogenetic and Pharmacotherapeutic (clinical, epidemiological, economic and ethical aspects of the use of biotechnological drugs, genetic polymorphisms). Applications of biotechnology (amino acids, proteins, enzymes, hormones, vitamins, secondary metabolites, antibiotic production, vaccines and monoclonal antibodies production) Laboratory exercises: As part of the course, laboratory exercises are carried out on the course material for a better deepening and consolidation of the theoretical part. Indicative exercises are: 1. Restriction enzyme cleavage of genetic material 2. PCR reaction and gene cloning 3. Bacterial transformation and transfection in mammalian cells 4. DNA electrophoresis and Western Blotting 5. Search for information in databases (NCBI, Ensemble etc)		
Teaching Methodology	Teaching methodology includes lectures to better understand concepts of Pharmaceutical Biotechnology. Detailed lecture notes are presented with image-rich material and short animations to help understand better several biological processes. Methods such as discussion, questions/answers, pros/cons, brainstorming, debates, and cooperative learning are used to enhance the student's participation. Recent research results are included and discussed in the course. The written assignment helps students to grasp the ideas and concepts presented in the course. It is also used to demonstrate knowledge.		
Bibliography	(a) Textbooks: 1. Current applications of Pharmaceutical Biotechnology, Silva et al.,		

	Springer, 2020. 2. Pharmaceutical Biotechnology, Fundamentals and Applications, Crommelin, Daan J. A., Sindelar, Robert, Meibohm, Bernd, 5th edition, 2019. (b) References: 1. "Φαρμακευτική Βιοτεχνολογία: Έννοιες και εφαρμογές", G. Walsh, Wiley; 1η έκδοση, 2012 2. Ανασυνδυασμένο DNA. Γονίδια και γονιδιώματα Μια συνοπτική παρουσίαση. " Watson, J. D., Myers, R.M., Caudy, A.A., Witkowski, J.A. Ακαδημαϊκές Εκδόσεις Ι. Μπάσδρα & Σια, 2012
Assessment	The overall grade is determined by a written midterm exam (20%), laboratory reports (20%) and a written final exam (60%). The mid-term exam is carried out between the 6th and 8th week and it mainly includes short answer questions and problem- solving questions and examines specific modules of the course. As far as the laboratory grade is concerned, it comprises of the evaluation of the laboratory reports (60% of the laboratory grade) submitted by the students after every experiment and a final laboratory examination (40% of the laboratory grade) which mainly includes short answer questions and problem-solving questions. In their laboratory reports, students are asked to describe the experimental procedure, to evaluate and analyse their results and to answer specific questions. The following criteria are taken into account when evaluating laboratory reports: (a) experimental data collection (30%), (b) data analysis (40%), and application of theory to draw conclusions (30%). The final exam of the course is carried out during the 14th-16th week of each semester and includes short answer questions, decision questions, and problem-solving questions regarding all course modules. The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course.
Language	Greek, English