European University Cyprus

"Pharmacy (5 Years/300ECTS, Integrated Master)"

(Approval by DIPAE – 83rd Summit, 20 June 2022
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"Pharmacy (5 Years/300ECTS, Integrated Master)"

The aim of the Integrated Master's Degree in Pharmacy is to provide elevated general, theoretical and laboratory knowledge and skills based on the most recent scientific breakthroughs. An additional aim is to cultivate specific specialized attitudes to enable graduates to find immediate employment or, if they wish, to pursue further studies in related topics.

The Program sets out to offer general theoretical and laboratory training in the pharmaceutical sciences, broken down into sectors and branches such as Pharmacology, Pharmaceutical Chemistry, Pharmaceutical Analysis, Pharmaceutical Technology, Pharmacognosy, Toxicology, etc. During the first two years of their studies, students will complete courses in Chemistry, Biology and the Medical Sciences. The Program has been designed according to the structure of the degree in Pharmacy offered at European Union universities and fulfils all requirements set by the EU for the professional recognition of Pharmacists (DIRECTIVE 2005/36/EC). The Program places special emphasis on the acquisition of appropriate practices and laboratory skills to facilitate immediate employment after graduation. Graduates of the Program are also able to pursue studies in other relevant fields such as Public Health, Medicine, etc.

LEARNING OUTCOMES:

After completing this program, students will be able to:

1. Demonstrate fundamental theoretical knowledge of the pharmaceutical sciences, and more particularly:
   - adequate knowledge of the raw materials used for the manufacture of pharmaceuticals
   - adequate knowledge of the pharmaceutical technology and of the physical, chemical and microbiological testing of pharmaceuticals
   - adequate knowledge of the metabolism and the effects of pharmaceuticals and the action of toxic substances, as well as of the use of pharmaceuticals
   - adequate knowledge to allow the evaluation of scientific data about pharmaceuticals and therefore enable the provision of required information
   - adequate knowledge of legal and other requirements for the performance of pharmaceutical activities.
2. Gain those skills and experiences that adequately prepare them for a career in branches and fields related to the pharmaceutical sciences or for further studies.
3. Acquire basic yet substantial laboratory skills in a broad range of analytical and research fields.
4. Develop critical thinking and problem-solving abilities, working either on their own or in groups.
5. Recognize the huge significance of the science of Pharmacy and its applications in daily life, the economy and life in general.

6. Make a positive contribution to the scientific/research arena of the pharmaceutical sciences, more particularly in the direction they choose to follow and serve.
7. Demonstrate and consistently apply morality and ethics both in their professional career and in their research activities.

EMPLOYMENT OPPORTUNITIES:

The Integrated Master of Pharmacy is built around an innovative program of studies which, beyond the basic knowledge and skills a pharmacist must own, familiarizes students with an array of groundbreaking, patient-related fields. These include technologies expected to play a significant role in the Health sector in the immediate future (e.g. Virtual and Augmented Reality Technologies). Graduates of the Program are well prepared to tackle future professional challenges. Furthermore, the Program participates in cutting edge fields that are interlinked with the pharmaceutical sciences, such as pharmaceutical chemistry, molecular pharmacology, pharmacology, pharmacognosy, pharmaceutical technology, biopharmaceutics, pharmaceutical analysis, toxicology, structural biology, and cosmetology.

Therefore, by gaining the Integrated Master of Pharmacy, graduates are adequately prepared to exercise their profession and participate in license-to-practice exams organized by the competent Pharmaceutical Services of Cyprus, Greece, EU and the rest of the world. Graduates achieve excellence in scientific writing, laboratory skills, scientific presentation skills, honed abilities in critical thinking and in designing research programs. Consequently, graduates have the opportunity to choose from a broad range of employment and career options, including:

- Pharmacies (Community Pharmacies, Hospital Pharmacies, Pharmacy Storehouses)
- Health Ministry Services (Pharmaceutical Services)
- Pharmaceutical Industry
- Cosmetics Industry
- Pharmaceutical regulatory agencies and organizations.

SPECIFIC ADMISSION REQUIREMENTS:

Candidates are expected to hold a High School Degree with a grade of 17 or higher, which will include the calculation of their grades in Chemistry and Biology (Specialized Courses/Advanced Level).

Candidates not meeting the specific requirement may still be admitted to the program by attending prior to their admission the two following preparatory courses of Chemistry and Biology that are offered by the University and succeeding in the corresponding exams:

- CHE 095 Chemistry
- BIO 095 Biology

"Pharmacy (5 Years/300ECTS, Integrated Master)"

TABLE 1: STRUCTURE OF THE PROGRAM OF STUDY

PROGRAM REQUIREMENTS	ECTS
All students pursuing the Integrated Master of Pharmacy (M.Pharm.) program of European University Cyprus must complete the following requirements:	
First Year Courses	**60**
Second Year Courses	**60**
Third Year Courses	**60**
Fourth Year Courses	**60**
Fifth Year Courses	**60**
Total ECTS	**300**

Course Code	Course Name	ECTS
First Year Courses		
1st Semester		
PHA100	General and Inorganic Chemistry	6
PHA115	Mathematics for Pharmaceutical Sciences	6
PHA120	Introduction to Pharmaceutical Sciences	6
LFS120	Molecular and Cellular Biology	6
-	Free Elective	6
2nd Semester		
PHA125	Organic Chemistry I	6
PHA130	Pharmaceutical Physics	3
PHA135	Inorganic Pharmaceutical Chemistry	6
HEA180	Biostatistics	3
HEA150	Anatomy and Physiology	6
-	Free Elective	6
Second Year Courses		
3rd Semester		
PHA200	Pharmaceutical Microbiology	6
PHA205	Organic Chemistry II	6
PHA210	Principles of Immunology	6
PHA215	Elements of Botany	6
EHL200	English Medical Terminology and Literacy	6
4th Semester		
PHA230	Drug Design and Development	6
PHA235	Analytical Chemistry	6

PHA240	Pharmacognosy I	3
PHA250	Pharmaceutical Biotechnology	3
PHA255	Biochemistry	6
-	Pharmaceutical Elective*	6
Third Year Courses		
5th Semester		
PHA300	Biopharmaceutics and Pharmacokinetics	6
PHA305	Molecular and Biochemical Pharmacology	6
PHA310	Pharmaceutical Chemistry I	6
PHA315	Pharmaceutical Technology I	6
-	Pharmaceutical Elective*	6
6th Semester		
PHA320	Pharmaceutical Analysis and Quality Control I	6
PHA330	Pharmacology I	6
PHA335	Pharmaceutical Chemistry II	6
PHA340	Pharmaceutical Technology II	6
PHA345	Pharmacognosy II	6
Fourth Year Courses		
7th Semester		
PHA400	Pharmaceutical Analysis and Quality Control II	6
PHA405	Pharmacology II	6
PHA420	Evidence-Based Medicine and Critical Literature Assessment Skills	3
PHA425	Toxicology	6
PHA430	Law and Ethics in Pharmacy I	3
-	Pharmaceutical Elective*	6
8th Semester		
PHA435	Pharmacology III	6
PHA440	Clinical Pharmacy and Therapeutics	6
PHA445	Law and Ethics in Pharmacy II	6
PHA450	Pharmaceutical Care and Communication	6
-	Pharmaceutical Elective*	6
Fifth Year Courses		
9th Semester		
PHA500	Integrated Master Thesis	30
10th Semester		
PHA530	Practical Training**	30
Pharmaceutical Elective Courses*		
Students select 4 out of 7 elective courses		
PHA260	Pharmaceutical Marketing and Management	6
PHA265	Health Economics	6
PHA270	Pharmaceutical Regulatory Affairs	6
PHA275	Cosmetology-Cosmetics Technology	6

PHA280	Principles of Nuclear Pharmacy/Radiopharmaceuticals	6
PHA285	Nutrition and Disease	6
PHA290	Pharmacoepidemiology and Pharmacovigilance	6

* Students select 4 out of 7 Pharmaceutical Elective courses
**The duration of the course PHA530 Practical Training is 6 calendar months

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TABLE 2: COURSE DISTRIBUTION PER SEMESTER

A/A	Course Type	Course Name	Course Code	Periods per week	Period duration	Number of weeks/ Academic semester	Total periods/ Academic semester	Number of ECTS
1st Semester								
1.	Compulsory	General and Inorganic Chemistry	PHA100	5	50	14	70	6
2.	Compulsory	Mathematics for Pharmaceutical Sciences	PHA115	3	50	14	42	6
3.	Compulsory	Introduction to Pharmaceutical Sciences	PHA120	3	50	14	42	6
4.	Compulsory	Molecular and Cellular Biology	LFS120	4	50	14	56	6
5.	Elective	Free Elective	-	3	50	14	42	6
2nd Semester								
6.	Compulsory	Organic Chemistry I	PHA125	3	50	14	42	6
7.	Compulsory	Pharmaceutical Physics	PHA130	2	50	14	28	3
8.	Compulsory	Inorganic Pharmaceutical Chemistry	PHA135	4	50	14	56	6
9.	Compulsory	Biostatistics	HEA180	2	50	14	28	3
10.	Compulsory	Anatomy and Physiology	HEA150	4	50	14	56	6
11.	Elective	Free Elective	-	3	50	14	42	6
3rd Semester								
12.	Compulsory	Pharmaceutical Microbiology	PHA200	4	50	14	56	6
13.	Compulsory	Organic Chemistry II	PHA205	5	50	14	70	6
14.	Compulsory	Principles of Immunology	PHA210	3	50	14	42	6
15.	Compulsory	Elements of Botany	PHA215	4	50	14	56	6
16.	Compulsory	English Medical Terminology and Literacy	EHL200	3	50	14	42	6

4th Semester								
17.	Compulsory	Drug Design and Development	PHA230	3	50	14	42	6
18.	Compulsory	Analytical Chemistry	PHA235	5	50	14	70	6
19.	Compulsory	Pharmacognosy I	PHA240	2	50	14	28	3
20.	Compulsory	Pharmaceutical Biotechnology	PHA250	2	50	14	28	3
21.	Compulsory	Biochemistry	PHA255	4	50	14	56	6
22.	Elective	Pharmaceutical Elective*	-	3	50	14	42	6
5th Semester								
23.	Compulsory	Biopharmaceutics and Pharmacokinetics	PHA300	5	50	14	70	6
24.	Compulsory	Molecular and Biochemical Pharmacology	PHA305	3	50	14	42	6
25.	Compulsory	Pharmaceutical Chemistry I	PHA310	3	50	14	42	6
26.	Compulsory	Pharmaceutical Technology I	PHA315	3	50	14	42	6
27.	Elective	Pharmaceutical Elective*	-	3	50	14	42	6
6th Semester								
28.	Compulsory	Pharmaceutical Analysis and Quality Control I	PHA320	3	50	14	42	6
29.	Compulsory	Pharmacology I	PHA330	3	50	14	42	6
30.	Compulsory	Pharmaceutical Chemistry II	PHA335	5	50	14	70	6
31.	Compulsory	Pharmaceutical Technology II	PHA340	4	50	14	56	6
32.	Compulsory	Pharmacognosy II	PHA345	5	50	14	70	6
7th Semester								
33.	Compulsory	Pharmaceutical Analysis and Quality Control II	PHA400	5	50	14	70	6
34.	Compulsory	Pharmacology II	PHA405	3	50	14	42	6
35.	Compulsory	Evidence-Based Medicine and Critical Literature Assessment Skills	PHA420	2	50	14	28	3
36.	Compulsory	Toxicology	PHA425	3	50	14	42	6

37.	Compulsory	Law and Ethics in Pharmacy I	PHA430	2	50	14	28	3
38.	Elective	Pharmaceutical Elective*	-	3	50	14	42	6
8th Semester								
39.	Compulsory	Pharmacology III	PHA435	3	50	14	42	6
40.	Compulsory	Clinical Pharmacy and Therapeutics	PHA440	3	50	14	42	6
41.	Compulsory	Law and Ethics in Pharmacy II	PHA445	3	50	14	42	6
42.	Compulsory	Pharmaceutical Care and Communication	PHA450	3	50	14	42	6
43.	Elective	Pharmaceutical Elective*	-	3	50	14	42	6
9th Semester								
44.	Compulsory	Integrated Master Thesis	PHA500	-----	-----	-----	-----	30
10th Semester								
45.	Compulsory	Practical Training**	PHA530	-----	-----	-----	-----	30

Pharmaceutical Elective Courses*								
46.	Elective	Pharmaceutical Marketing and Management	PHA260	3	50	14	42	6
47.	Elective	Health Economics	PHA265	3	50	14	42	6
48.	Elective	Pharmaceutical Regulatory Affairs	PHA270	3	50	14	42	6
49.	Elective	Cosmetology-Cosmetics Technology	PHA275	3	50	14	42	6
50.	Elective	Principles of Nuclear Pharmacy/Radiopharmaceuticals	PHA280	3	50	14	42	6
51.	Elective	Nutrition and Disease	PHA285	3	50	14	42	6
52.	Elective	Pharmacoepidemiology and Pharmacovigilance	PHA290	3	50	14	42	6

* Students select 4 out of 7 Pharmaceutical Elective courses
**The duration of the course PHA530 Practical Training is 6 calendar months

INDEX

COURSE DESCRIPTION

Course Title	General and Inorganic Chemistry				
Course Code	PHA100				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year /1st Semester				
Teacher's Name	Dr. Eleni Moushi				
ECTS	6	Lectures / week	3hrs/14 weeks	Laboratories / week	2hrs/14 weeks
Course Purpose and Objectives	• This introductory course is taught in the first semester of studies when students of the Pharmacy Program are expected to familiarize themselves with basic concepts and principles of inorganic chemistry such as structure of atoms and molecules, orbitals, chemical bond formation, the electronic effects, the periodic table and periodic properties of elements. • This course aims to provide the students with the required background for further understanding of stereochemistry that leads to the chemistry of complexes, an indispensable tool for the understanding of multiple biological processes, such as enzymatic reactions. • Finally, students will get acquainted with the chemical laboratory, basic chemical techniques, good laboratory practice and safety regulations when performing chemical experiments.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Recall basic concepts such as: atom, molecule, atomic and molecular orbitals, and chemical bond • Predict basic physicochemical properties of molecules based on their chemical structure • Perform simple chemical calculations and write simple chemical reactions • Recognize, name and classify inorganic compounds • Define molecular geometry • Describe a chemical laboratory as well as basic techniques used for the study of simple molecules • Apply safety rules when performing laboratory exercises in chemistry				
Prerequisites	None	Co-requisites	None		
Course Content	**Theory** • Structure of the atom, hydrogen atom, atomic orbitals, electron configuration, hybridization, periodic table • Chemical bonds (covalent, non-covalent), structure of molecules, molecular orbitals. • Solutions, electrolytes, acids, bases, salts, pH, buffers.				

<table>
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Structure of molecules, Lewis structures, multiple bonds, elementary solid state. Metal Bond, liquid state, gaseous state.
Thermodynamics: free energy, enthalpy, entropy, equilibrium, stoichiometry.
Mole definition, pressure, volume, temperature, concentration, solution, chemical reaction kinetics, activation parameters.
Chemical reactions: classification, types, chemical equilibrium, chemical kinetics, oxidation-reduction reactions.
Theory of acids and bases, chemical reactions, energy, basicity, acidity, nucleophilicity, electrophiles.
Stereochemistry, nomenclature of inorganic compounds

<u>Laboratory exercises</u>

The chemical laboratory, description of basic safety principles.
Familiarization with basic chemical utensils and devices-Basic Laboratory Techniques
Assessment of physical constants
Preparation of solutions, mass and density of solutions
pH measurement and buffer solutions, salt solubility
Chemical reactions.
Chromatography
Titration
Laboratory report writing

</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>General Chemistry (10th Edition), Gammon S.D, Ebbing D, Brooks Cole, 2014. (Translation in Greek by Nikolaos Klouras). (latest edition)
General and Inorganic Chemistry, Manousakis G., Publisher Kyriakides, 2016. (latest edition)

Descriptive Inorganic Chemistry, J. E. House, K. A. House, 3rd Edition, Elsevier, 2016. (latest edition)

'The Chemical Bond', Murrel J.N, Kettle S.F, Tedder J.M. , John Wiley & Sons Ltd, 2nd ed, 1985., Publisher University of Crete, 2011. (latest edition)</td></tr>
<tr><td>Assessment</td><td>
<table>
<tr><td>Exams</td><td>70%</td></tr>
<tr><td>Assignments/Lab</td><td>20%</td></tr>
<tr><td>Class Participation and Attendance</td><td>10%</td></tr>
<tr><td></td><td>100%</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Mathematics for Pharmaceutical Sciences				
Course Code	PHA115				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year/1st Semester				
Teacher's Name	Dr. Ioannis Michos				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	This course provides a good knowledge of the basics of mathematical calculus, a powerful mathematical tool in Engineering and Sciences.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Solve problems by applying elementary algebra. • Produce graphs of polynomial equations of first and second degree and to explain features of the graphs such as: intercepts, vertex, slope, line of symmetry and translations. • Recognize functions and to perform operations on functions such as: addition, multiplication, division, composition. • Identify the domain and range of a function and solve problems involving the domain and range. • Identify and solve problems involving inverse functions, exponential and logarithmic functions and equations. • Solve problems involving systems of two equations in two unknowns, using the method of substitutions or the theorem of equivalent systems. • Calculate the derivative of a function using various techniques • Apply the derivative to solve real problems				
Prerequisites	None	Co-requisites	None		
Course Content	Algebra and Real Numbers, Exponents, Radicals, Basic Operations and Factoring of Polynomials, Basic Operations of Rational Expressions. Long Division of Polynomials. Linear Equations and Applications, Quadratic Equations and Applications. Linear Inequalities, Absolute Value, Linear Inequalities with Absolute Value. Cartesian Coordinate System, Distance Formula, Equation of a Line (slope-intercept and point-slope forms), Parallel and Perpendicular Lines. Functions, Domain and Range, Graphs and Transformations of Functions, Operations on Functions and Composition. Symmetry of functions. Actions between functions. Composition functions. Inverse Functions, Exponential and Logarithmic Functions, Graphs and Properties of Exponential and Logarithmic Functions, Exponential and Logarithmic Equations.				

	Calculation of limits. One-sided limits. Theorems for calculating limits. Continuous functions. Types of discontinuity. Introduction to derivatives: tangent line and derivative. Derivative at a point, as a function and as a rate of change. Instantaneous speed. Product and quotient rules. Chain rule.
Teaching Methodology	Face- to- face
Bibliography	Barnett, Ziegler, Byleen, PRECALCULUS McGraw-Hill (Latest edition) Sullivan, M., PRECALCULUS, Pearson-Prentice Hall (Latest edition) Anton, H., CALCULUS WITH ANALYTIC GEOMETRY, Wiley
Assessment	Exams 90 Assignments/Lab 0 Class Participation and Attendance 10 100%
Language	Greek and English

Course Title	Introduction to Pharmaceutical Sciences				
Course Code	PHA120				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year/ 1st Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / weeks	3hrs /14 weeks	Laboratories / weeks	None
Course Purpose and Objectives	The purpose of this course is to introduce students to all the different aspects of the Pharmaceutical Sciences, which define the practice of pharmacy in modern times. It serves as an introduction to the content of the courses involved in the making of a pharmacist, and provides an overview of the academic skills required of a pharmacy student.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Describe the development of pharmacy practice through the centuries and identify key figures who contributed to its evolution • Recognize and define the core subjects that constitute the Pharmaceutical Sciences • Discuss the importance of medicines for health and describe the process of drug discovery • Explain the roles of the pharmacist in different professional sectors • Locate and utilise information resources that are typically used by pharmacists and pharmaceutical scientists • Apply basic academic skills to communicate scientific information				
Prerequisites	None	Co-requisites	None		
Course Content	• The scope of pharmacy practice • The evolution of pharmacy: Historical overview of pharmaceutical practice and figures with an important role in therapeutics • The drug discovery process, from bench to bedside • Core subjects in pharmacy: Pharmacognosy • Core subjects in pharmacy: Pharmaceutical Chemistry • Core subjects in pharmacy: Pharmaceutical analysis and quality control • Core subjects in pharmacy: Pharmacokinetics & Pharmacodynamics • Maths, Physics & Chemistry for pharmacists • Pharmaceutical dosage forms • Fundamentals of pharmacy practice				

<table>
<tr><td></td><td>Information resources in pharmacy and the Pharmaceutical Sciences
Introduction to academic skills and principles: research, research protocols, ethics, writing and presenting scientific information</td></tr>
<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>Zebroski B: A brief history of pharmacy: humanity’s search for wellness, Routledge, an imprint of Taylor & Francis (2016)

Loyd V Allen Jr (editor): Remington: An introduction to Pharmacy, Pharmaceutical Press (2013)</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Exams</td><td>60%</td></tr><tr><td>Assignments/Lab</td><td>30%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Molecular and Cellular Biology				
Course Code	LFS120				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year /1st Semester				
Teacher's Name	Dr. Christiana Neophytou				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	2hrs/ 14 weeks
Course Purpose and Objectives	First-year students will have a comprehensive understanding of the basic and fundamental principles governing Molecular Cell Biology, its applications in research, pharmacology and biotechnology. Through the Central Dogma of Molecular Biology, students will be able to understand the molecular mechanisms that drive gene regulation and protein synthesis. In addition, students will gain extensive practical skills through a series of laboratory sessions, including isolation of genomic and plasmid DNA, isolation of total RNA, agarose gel electrophoresis, PCR reactions, digestion and mapping of plasmids. The structure of the course aims to prepare students for a wide spectrum of post-baccalaureate paths and successful professional employment.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Describe the basic principles of Molecular Biology • Describe the Central Dogma of Molecular Biology and explain DNA replication, transcription and translation-understand the flow of genetic information in prokaryotes and eukaryotes • Describe the role of enzymes in Molecular Biology • Explain and apply multiple molecular techniques such as nucleic acid isolation, PCR, RT-PCR, plasmid digestion, bacterial transformation etc. • Demonstrate laboratory competence and professionalism in molecular techniques • Apply Biosafety rules				
Prerequisites	None	Co-requisites	None		
Course Content	**Theory**: - Introduction to Molecular Biology. Historical Background - Genetic Material. Gene expression mechanisms. From DNA to Protein. Replication, Transcription, Translation, Recombination, DNA Repair. Genetic engineering. - Chromatin and mechanisms of gene expression regulation - Protein synthesis and protein modifications. - Flow of genetic information, Nuclear organisation and dynamics - Methods of nucleic acid isolation (plasmid, viral, DNA). Methods of isolating RNA (total and poly A-RNA). Methods of analysing DNA and RNA. Gel electrophoresis (agarose and polyacrylamide gels). Membrane transfer technique (Southern and Northern blotting).				

	Specific methods of RNA analysis (protection against RNAase, primer extension). - Non-coding RNAs (microRNAs, siRNAs, piRNAs, long ncRNAs). - Polymerase Chain Reaction (PCR method): Its mechanism, primer selection: The most critical PCR parameter, degenerate primers, cloning of PCR products, polymerase chain reaction (PCR), Polymerase Chain Reaction hot start PCR, nested PCR, inverse PCR, reverse transcription PCR, differential expression PCR, SELEX (Systematic Evolution of Ligands by Exponential Enrichment), In vivo footprinting. PCR in polymorphism analysis. Real Time PCR. - Applications of Molecular Biology in Research, Genetic Engineering and Biotechnology **Laboratory Exercises**: - Main Lab Equipment - Basic Techniques - Validation of Laboratory Results - Common Problems - Isolation of small-scale plasmid DNA - miniprep) and restriction enzyme digestion - Isolation of genomic DNA and calculation of its concentration - Isolation of total RNA by extraction into solution of guanidine thiocyanate - phenol - Chloroform - Polymerase Chain Reaction (PCR) - Preparation: Primer Design, Amplification. Real Time PCR. Confirmation by gel electrophoresis.
Teaching Methodology	Face- to- face
Bibliography	Molecular biology. From genes to proteins. Tropp B. Greek Translation. Academic Publishing, 2013 (the most recent version). Molecular Cell Biology. Scientific America. Recombinant DNA - Genes and Genomes - A Brief Introduction. J. D. Watson, A. A. Caudy, R. M. Myers, J. A. Witkowski. Academic Publishing 2007 (the most recent version). Enzymes and their use in Molecular Biology. Sandaldzopoulos - G. Skadis (Alexandroupolis 2007). Laboratory Calculations in Biological Sciences. Seidman L. Academic Publications 2011.
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Organic Chemistry I				
Course Code	PHA125				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year/2nd Semester				
Teacher's Name	Dr. Andreas Kalogirou				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The course aims to introduce the student of pharmacy to the world of organic chemistry and provide him/her with general knowledge required to understand the courses that require a good knowledge of organic chemistry. In more detail the students will know the structure and properties (physical and chemical) of the main homologous series in organic chemistry, simple mechanisms of organic reactions, the structure and function of organic compounds required for living organisms (biomolecules) as well as basic spectroscopic techniques that allow the identification and characterization of organic molecules.				
Learning Outcomes	Upon successful completion of the course, students will be able to: -Recognize the structures of molecules and the main reactions in organic chemistry, -Describe the main spectroscopic techniques, -Describe the main principles and rules of stereochemistry, -Determine the main categories of organic compounds and biomolecules, name them and describe their properties and mechanisms of basic reactions, -Recognize the main techniques of spectroscopic characterization, -Analyze the structure of organic molecules, -Suggest series of reactions for the synthesis of simple organic compounds designing the most efficient route, -Group organic compounds.				
Prerequisites	None		Co-requisites	None	
Course Content	Sorting and naming of organic compounds. Structure of the atoms of carbon, hydrogen, oxygen, sulfur and nitrogen. Chemical bonds and structural properties. Inductive effect and resonance. Categories of reactions and reaction mechanisms. Stereochemistry: Enantiomers, diastereoisomers and geometrical isomers. Elements of spectroscopy: Mass spectrometry, IR and NMR spectroscopies.				

	Alkanes and cycloalkanes. Alkenes. Alkynes. Alcohols, phenols.
Teaching Methodology	Face- to- face
Bibliography	McMurry J, Organic Chemistry, Πανεπιστημιακές Εκδόσεις Κρήτης, 2012 or latest edition. Επίτομη οργανική χημεία, Author: Αναστάσιος Γ. Βάρβογλης Publisher: Ζήτη, Edition: 01-2005. Organic Chemistry, 10th Edition, by T.W. Solomons and C.B. Fryhle (Publisher: Wylie). Organic Chemistry, 2nd Edition 2012, by Jonathan Clayden, Nick Geeves, Stuart Warren, Oxford University Press.
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmaceutical Physics				
Course Code	PHA130				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year/2nd Semester				
Teacher's Name	Dr. Andreas Stylianou				
ECTS	3	Lectures / week	2hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The aim of this course is to help the student of Pharmacy to understand and consolidate the basic and fundamental principles of pharmaceutical physics, physical chemistry and to get to know their application in Pharmaceutical technology.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Describe the application of the basic principles of pharmaceutical physics and physical chemistry in the pharmaceutical sciences • Describe the basic physicochemical processes applied in pharmaceutical technology • Describe the nature and properties of solutions and different dispersion systems • Analyze the basic principles of rheology • Set out the basic principles of polymer science elements • Describes the basic principles of analytical methods and microscopy techniques				
Prerequisites	None	Co-requisites	None		
Course Content	**Metrology and introductory concepts** Physical sizes & measurements, the International System of Units (SI), scientific symbolism, unit agreement and unit changes, metrology, units of length / surface / volume / mass, empirical dosing units, drop / dropper **Basic principles of physics** Principles of classical mechanics (position, displacement, distance, velocity, acceleration, force, Newton's laws, work), Electromagnetic waves (electromagnetic waves, electromagnetic spectrum, X-rays, X-rays lamps, X-ray applications), Optics (the nature of light, light at an interface, reflection, refraction, Snell's law **Physical chemistry-Thermodynamics** Elements of thermodynamics and thermochemistry, Laws of thermodynamics, thermodynamic quantities, internal energy, work, heat, enthalpy, reversible thermodynamic changes, entropy **States of matter**				

	Gaseous state, solid state, liquid state **Small particles - Powders** Particle size, ways of expressing particle diameter, particle size measurement, evaluation of particle size measurements, volume / density / porosity of powders and particles, particle layout, particle layout, microparticles in Pharmacy **Solutions-Solubility of drugs** Types of solutions, solubility of medicinal substances, stages involved in the dissolution process, aqueous solutions, pH / pH determination, buffers **Dispersion systems - Intra-surface phenomena** Dispersed systems, types of dispersing systems, Intra-surface phenomena, Surface and intra-surface stresses, pharmaceutical applications of dispersion systems, Stability of dispersion systems **Rheology** Introductory concepts, fluid Categories (Newtonian systems, non-Newtonian systems), Rheological properties **Polymer science elements** Classification, molecular characterization, synthesis, crystallinity, dissolution (Flory-Huggins theory), swelling, polymer applications in pharmacy **Analytical methods and microscopy techniques** X-ray diffraction analysis (XRD), Thermogravimetric analysis (TGA), Differential scanning calorimetry (DSC), Scanning electron microscopy (SEM), transmission electron microscopy (TEM), Atomic Force Microscopy (AFM)
Teaching Methodology	Face- to- face
Bibliography	• Φαρμακευτική Τεχνολογία Ι Γ. ΠΑΠΑΪΩΑΝΝΟΥ, Κ. ΔΕΜΕΤΖΟΣ, Μ. ΒΛΑΧΟΥ-ΚΩΝΣΤΑΝΤΙΝΙΔΟΥ Εκδότης: ΠΑΡΙΣΙΑΝΟΥ Α.Ε 2009. ISBN:978-960-394-487-4 (Τελευταία έκδοση) • Μαθήματα φυσικής φαρμακευτικής Κτίστης Γεώργιος Εκδότης: Ζήτη 2007 ISBN: 978-960-456-062-2 (Τελευταία έκδοση) • "Applied Physical Pharmacy: An introduction of physical chemical principles", B.J. Sandmann, McGrowHill, Ελευθερουδάκης, 2002. (Τελευταία έκδοση) • Physicochemical Principles of Pharmacy, Florence A., Attwood D. (1993) Macmillan, London (Latest edition) • MARTIN'S PHYSICAL PHARMACY AND PHARMACEUTICAL SCIENCES Physical Chemical and Biopharmaceutical Principles in the Pharmaceutical Sciences SIXTH EDITION Lippincott Williams & Wilkins (Latest edition) • Physics of the Life Sciences, Newman, Jay, ISBN 978-0-387-77259-2

Assessment	Exams Assignments/tests Class Participation and Attendance	70% 20% 10% 100%
Language	Greek and English	

Course Title	Inorganic Pharmaceutical Chemistry				
Course Code	PHA135				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year /2nd Semester				
Teacher's Name	Dr. Eleni Moushi				
ECTS	6	Lectures / week	2hrs/14 weeks	Laboratories / week	2hrs / 14 weeks
Course Purpose and Objectives	This course is designed to introduce Pharmacy students to the world of Pharmaceutical Chemistry and provide general background on the role of various inorganic compounds as impurities, medicaments, or excipients according to those of the current pharmacopoeias. In addition, this course will introduce students to the basic concepts of elements and compounds with radiopharmaceutical properties				
Learning Outcomes	Upon successful completion of the course, students will be able to: ▪ Explain the origin of impurities in pharmaceuticals ▪ Identify limits and controls for various impurities ▪ Describe the most important inorganic compounds with pharmaceutical or therapeutic use as well as their characterization methods ▪ Describe the synthesis and structure of various chelating complexes as well as their use as therapeutic agents. ▪ Write reactions of the most common cations and anions and apply methods and techniques of qualitative analysis for the qualitative determination of known and unknown solutions. ▪ Apply gravimetric, volumetric and complexometric analysis techniques. Apply safety rules when performing laboratory exercises in chemistry				
Prerequisites	PHA100	Co-requisites	None		
Course Content	**Theory** Introduction to Pharmaceutical Chemistry. Definitions and basic principles. The origin of impurities in pharmaceuticals. Impurity types and limits controls for chlorides, sulfates, arsenic, lead, heavy metals and iron. Systematic study of the following inorganic compounds with reference to their formulations, properties, identity and purity tests and methods of their determination based on the pharmacopoeia • Group IA: sodium and potassium salts: Sodium benzoate, Sodium bicarbonate, Sodium Chloride, Sodium citrate, Sodium fluoride, sodium metabisulfide, sodium phosphate, Potassium sodium tartrate, potassium permanganate, potassium				

	dichromate, Potassium chloride, Potassium bromide, Potassium Iodide. • Group IB: Copper, Silver and Gold Compounds: Copper sulfate, Copper nitrate, Protein binding with silver. • Group IIA: Magnesium, Calcium and Barium Compounds: Magnesium carbonate, Magnesium hydroxide, Magnesium sulfate, Magnesium trisilicate, Magnesium stearate, Calcium gluconate, Calcium acetate, Calcium chloride, Calcium lactate, Barium sulfate. • Group IIB: Zinc and Mercury Compounds: Zinc oxide, Zinc stearate, Zinc chloride, Yellow Mercury oxide, Dimercury dichloride (Calomel), Mercuric amidochloride • Groups IIIA and IIIB: Boron and Aluminum Compounds: Boric acid, Aluminum hydroxide gel, Aluminum-magnesium trisilicate, Alums. • Groups IVA and IVB: Bentonite and Kaolin. • Groups VA and VB: Nitrogen, Antimony and Bismuth Compounds: Ammonium Solutions, Ammonium acetate solutions, Ammonium chloride, Sodium stibogluconate, Bismuth subcarbonate. • Group VIB: Sulfur and Selenium Compounds: Sulfur (vapors and sediment), Selenium sulfite. • Groups VIIA and VIIB: Hydrogen, Oxygen and Halogen Compounds: Purified water, Water for injections, Hydrogen peroxide, Iodine Solutions. • Group VIII: Iron Compounds: Iron sulfate (II), Iron gluconate, Ferric ammonium citrate, Iron dextran Injections. • Selected Topics • Electrolytes and their natural role. • Medical use of lithium. • Platinum complexes and their applications • Gold (I) compounds and their use as therapeutic agents. • Ruthenium, Titanium and Gallium in Medicine. • Metal compounds as contrast agents for MRI and pharmaceutical application of radioactive substances. • Chelate Complexes and antidotes for heavy metals poisoning • Radiopharmaceutical Chemistry: Elements and compounds with interesting radiopharmaceutical properties. **Laboratory** • Preparation of solutions of known concentration. • Characteristic reactions of cations and anions • Separation and identification of a mixture of cations. • Separation and identification of a mixture of anions. • Separation and identification of a mixture of ions (both cations/anions). • Synthesis of Inorganic Pharmaceutical Compounds • Volumetric analysis-Oxymetry, Alkalimetry, Complexometry
Teaching Methodology	Face- to- face
Bibliography	Inorganic Pharmaceutical Chemistry, Athena Geronikaki, (2nd Edition /2008), ISBN: 978-960-357-014-1. (latest edition)

	Radiopharmaceutical Chemistry, E. Chiotellis, Pigasos, 2000. (latest edition) Inorganic Chemistry, N. Hatziliadis, Th. Kampanos, A. Keramidas, S. Perlepes, Athens 2014 (latest edition) Pharmaceutical Chemistry - Inorganic (Vol. I), G.R. Chatwal, Madhu Arora (Editor), 2010. (latest edition) Pharmaceutical Inorganic Chemistry, Av Kasture, Sg Wadodkar, Nirali Prakashan, 2014. (latest edition) Radiopharmaceutical Chemistry, Jason Lewis, A.D. Windhorst, Brian M. Zeglis, 1st ed. 2019. (latest edition) European Pharmacopoeia, Atherden, L.M., Bentley and driver's Textbook of Pharmaceutical chemistry, Oxford University Press, New Delhi. Block, J.H., Roche, E., Soine, T.O., Wilson, C. O., Inorganic Medicinal and Pharmaceutical Chemistry, Lee Febiger, Philadelphia. Velha, G.,Vogel's Text Book of Inorganic Chemistry, Pearson Education. Rayner-Canham, G., Descriptive Inorganic Chemistry Freeman. Bassett, R.C., Denney, G.H., Mendham, J. Vogel's Textbook of Quantitative Inorganic Analysis, The ELBS and Longman, London.
Assessment	Exams 70 % Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Biostatistics				
Course Code	HEA180				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year /2nd Semester				
Teacher's Name	Dr. Ioannis Mamais				
ECTS	3	Lectures / week	2hrs / 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The aim of the course is to introduce students to basic concepts (such as variables and data, population and sample, sample estimation and population parameter) and analytical procedures (confidence intervals, hypothesis testing and statistical tests, correlation and linear regression) used in quantitative research in Health Sciences. The course aims to evaluate the role of Biostatistics as a fundamental tool of quantitative research by collecting, analyzing and interpreting statistical assessments and correlations. At the end of the course the student will be able to analyze data, prepare tables and charts and produce statistical results.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Recognize the role of statistics as a fundamental tool of quantitative research in health sciences • Manage data and choose the appropriate tables, diagrams and summary statistics • Choose the appropriate statistical test to investigate the relationship between two variables in the population • Apply statistical tests to actual data and explain the statistical results • Evaluate the statistical analysis used in published research studies as well as interpret the tables and diagrams presented in these studies				
Prerequisites	None	Prerequisites	None		
Course Content	Types of variables and data Frequency table data and diagrams (bar chart, histogram, frame diagram, and pixel) Describing data with summary measures of central location (arithmetic mean, median, mode) and dispersion (range, intra-molecular range, standard deviation and dispersion) Basic probability concepts, normal distribution and sample distribution				

	Confidence intervals for the population, the difference between two populations and the ratio of two population parameters Hypothesis Testing for the difference between population parameters (Independent Sample T-test and ANOVA Test) Hypothesis testing for the ratio of two population parameters The statistical test X^2 for the independence of two variables Correlation-correlation coefficient and linear regression
Teaching Methodology	Face- to- face
Bibliography	Bowers D. Θεμελιώδεις έννοιες στη Βιοστατιστική. Εισαγωγή για επαγγελματίες υγείας. Ελληνική επιμέλεια, Νίκος Μίτλεττον. Ιατρικές εκδόσεις Πασχαλίδης, Αθήνα, 2010 Pagano M, Gauvreau K. Αρχές Βιοστατιστικής. Ελληνική επιμέλεια - Ουρανία Δαφνή. ΕΛΛΗΝ, Αθήνα, 2002 ALTMAN D.G. Practical statistics for medical research. Chapman and Hall.(1991) Αποστολάκης Ι., Σταμούλη Μ.Α. Ασκήσεις υπολογιστικής στατιστικής στην υγεία. Τεύχος Α. Εκδόσεις Παπαζήση, Αθήνα, 2007 Λουκαϊδης Κ.Α. Στατιστική επεξεργασία δεδομένων με τη χρήση του IBM SPSS Statistics 19. Εκδόσεις Ηλία Επιφανίου, Λευκωσία, 2011
Assessment	Exams 70% Assignments 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Anatomy & Physiology				
Course Code	HEA150				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	1st Year/ 2nd Semester				
Teacher's Name	Dr. med. Greta Wozniak				
ECTS	6	Lectures / weeks	3hrs /14 weeks	Laboratories / weeks	1hr / 14 weeks
Course Purpose and Objectives	This course offers a systematic presentation of all areas of topographical anatomy and physiology of the human body at a general, yet information-rich level. It covers an appropriate breadth and depth of human Anatomy and Physiology, providing students with a foundation on which to underpin knowledge about the pathophysiology of disease and the mechanisms of drug action.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Understand and use basic anatomical terminology • Explain the fundamental principles of physiological regulation • Describe different types of tissues and relate key anatomical properties to their function • Identify the position, orientation and gross anatomy of individual organs in the body • Describe the anatomy and the physiological function of key systems in the human body • Explain how these separate systems interact in health and disease				
Prerequisites	None	Co-requisites	None		
Course Content	<u>THEORY</u> • Introduction to Anatomy & Physiology: systemic anatomy and topographic, homeostasis, cells & tissues • The integumentary system • The musculoskeletal system • **The nervous system** • **The circulatory system** • **The respiratory system** • **The urinary system** • **The immune system** • **The endocrine system** • **The reproductive system** <u>LABORATORY</u>				

	Students are trained in Anatomy and Physiology by using audiovisual means and models of organs. In addition, students are taught basic methods of quantitative measurement of physiological phenomena, and become familiar with accessing and utilizing information resources (libraries, e-libraries, and internet).
Teaching Methodology	Face-to-face
Bibliography	Hall JE, Hall ME: *Guyton and Hall Textbook of Medical Physiology* (14th Edition), ELSEVIER (2021) ISBN-13: 978-032-359-712-8 Paulsen F, Waschke J: *Sobotta Atlas of Human Anatomy* (16th Edition English/Latin), ELSEVIER (2019) ISBN 978-070-205-268-2 Derrickson HB, Tortora GJ: *Principles of Anatomy and Physiology* (16th edition), WILEY (2021) ISBN-13: 978-111-966-279-2 McCorry LK: *Essential of Human Physiology for Pharmacy* (2nd Edition), CRC Press, Taylor & Francis Group (2008) ISBN 978-142-004-390-7 Robert GC: *Elsevier's Integrated Physiology*, Mosby, ELSEVIER (2007) ISBN 978-032-304-318-2
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmaceutical Microbiology				
Course Code	PHA200				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year / 3rd Semester				
Teacher's Name	Dr. Agni Hadjilouka (theory) Mrs. Mary Liatsou (laboratory)				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	2hrs/ 14 weeks
Course Purpose and Objectives	The course aims at identifying, studying and analyzing microorganisms. Providing general knowledge to the student on introductory topics in Microbiology. Describe the basic mechanisms that govern the functioning and development and control of microorganisms (bacteria, viruses, fungi and parasites), the learning of basic laboratory microbiological techniques, the understanding of microbial control methods, and the interaction of microbes and humans.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Identify, name and classify Bacteria, Viruses, Fungi, Parasites • Describe the various requirements for microorganism development • Describe the various methods of control of microorganisms (Physical and Chemical) • Recognize the basic techniques through which microorganisms can be cultivated and studied in the laboratory • Describe host defense mechanisms				
Prerequisites	LFS120	Co-requisites	None		
Course Content	**Theory**: • Introduction to Microbiology and Historical Background • Classification of microorganisms • Prokaryotic cell vs eukaryotic cell: Morphological characteristics • Microbial nutrition - Nutrient requirements of microorganisms • Microbial cultivation and microbial growth • Microbial growth control: Physical methods • Microbial growth control: Chemical methods • The biology of Fungi • The biology of Viruses • The biology of Parasites				

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- Physiological Flora - Microbial and Human Host Relationship. Pathogenic and Opportunistic Pathogenic Microorganisms.

Laboratory exercises:

- The Microbiological Laboratory - Safety Rules
- Microbiological Nutrient Substrates - Aseptic techniques - Sterilization.
- Gram stains, Microscopy
- Estimation of the size of microbial populations.
- Microbial growth: Detection / enumeration of microbes
- Influence of natural agents on microbial growth.
- Evaluation of the effectiveness of antimicrobial substances - antibiotics

</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Madigan MT, Martinko JM, Dunlap PV, Clark DP, Biology of Microorganisms, University of Crete Publications, 2007

Bacteriology, Fungi, and Parasitology. Spicer W.J Parisian Publications 2008

Prescott LM, Harley JP, Klein DA., Microbiology (8th Edition), McGraw-Hill Science/Engineering/Math, 2011.</td></tr>
<tr><td>Assessment</td><td>
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<tr><td>Exams</td><td>60%</td></tr>
<tr><td>Assignments/Lab</td><td>30%</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Organic Chemistry II				
Course Code	PHA205				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year/3rd Semester				
Teacher's Name	Dr. Andreas Kalogirou / Dr. Petri Papaphilipou				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	2hrs/ 14 weeks
Course Purpose and Objectives	This course is the continuation of Organic chemistry I and aims to introduce the student of Pharmacy to the world of Organic Chemistry and provide him/her with general knowledge required to understand the courses that require a good knowledge of organic chemistry. In this unit the study of the homologous series is completed and the basic spectroscopic techniques used for the characterization of organic molecules are presented. The laboratory part of the course intends to transmit basic knowledge of experimental organic chemistry techniques, at a theoretical and experimental level, including synthesis, separation and identification of organic compounds.				
Learning Outcomes	Upon successful completion of the course, students will be able to: - Determine the main categories of organic compounds and biomolecules, name them and describe their properties and mechanisms of basic reactions, - Group organic compounds and analyze their structure, - Apply basic reactions for the identification of the major organic compounds, - Suggest series of reactions for the synthesis of simple organic compounds designing the most efficient route, - Apply the basic techniques for separation and identification of organic compounds, - Describe the main spectroscopic techniques and apply them to derive the structure of simple organic compounds.				
Prerequisites	PHA125	Co-requisites	None		
Course Content	<u>Theory</u> Benzene and derivatives. Halogenoalkanes, SN1, SN2, E1 and E2 reaction mechanisms. Ethers and sulfur containing compounds. Carbonyl compounds (Aldehydes and Ketones). Chemistry of the carbonyl group (α-substitution and condensation reactions). Carboxylic acids and their derivatives.				

	Amines, nitroalkanes and diazonium salts. Carbohydrates. Aminoacids and proteins. Nucleic acids and nucleotides. Lipids. Spectroscopic methods in organic chemistry. <u>Laboratory</u> Separation techniques: extraction, distillation and filtration. Recrystallization of benzoic acid and caffeine. Identification Techniques: Boiling - Melting Point, Refractive Index and Optical rotation. Synthesis and characterization of an ester. Utilization of different separation techniques for the isolation of natural substances. Ultraviolet, infrared and NMR Spectroscopy. Chromatographic Methods (Thin Layer Chromatography, TLC).
Teaching Methodology	Face-to-face
Bibliography	McMurry J, Organic Chemistry, Πανεπιστημιακές Εκδόσεις Κρήτης, 2012, or latest edition. Επίτομη οργανική χημεία, Author: Αναστάσιος Γ. Βάρβογλης Publisher: Ζήτη, Edition: 01-2005. Organic Chemistry, 10th Edition, by T.W. Solomons and C.B. Fryhle (Publisher: Wylie). Organic Chemistry, 2nd Edition 2012, by Jonathan Clayden, Nick Geeves, Stuart Warren, Oxford University Press.
Assessment	Exams 60% Assignments/Lab 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Principles of Immunology				
Course Code	PHA210				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year/ 3rd Semester				
Teacher's Name	Maria-Ioanna Christodoulou				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The aim of the course is to help students of Pharmacy understand basic and fundamental principles of Immunology, especially those of the innate and adaptive immune system, and so to comprehend its structure, organization and function during microbial infections. Immune dysregulation disorders will be also discussed.				
Learning Outcomes	Upon successful completion of the course, students will be able to: · Recall basic concepts of Immunology, the structure, cells and organs of the immune system · Describe the mechanisms of innate and adaptive immunity · Summarize the immune response of the host during microbial infections · Explain the importance of vaccines and readt-made antibodies · Explain the pathophysiological abnormalities of the immune system: immune deficiencies, autoimmune disorders, hypersensitivity immune reactions · Describe the basics of the immunology of transplantation				
Prerequisites	LFS120	Co-requisites	None		
Course Content	Aim: The aim of this course is to support the student to understand the basic and fundameltal principles of immunology, especially those of the adaptive and innate immune mechanisms of humans, in order to comprehend the structure, organization and function of the immune system in the cases of microbial infections. Pathophysiological processes of immune disorders will be also discussed. Description: Theory: · Basic principles of immunology, history and evolution · Structure and organization of the Immune and Lymphatic System; cells and organs · Resistance of the human host; Innate and Adaptive Immunity · Antigens. Recognition of antigen. · Structure and function of the antibodies · The Complement system · Inflammation and inflammatory response				

<table>
<tr><td></td><td>· Humoral and cellular mechanisms of the immune response (Regulation i the cellular and molecular level-Immune tolerance)
· Immune reaction towards infections
· Memory T and B lymphocytes
· Vaccines/Ready-made antibodies (Passive immunity)
·Major Histocompatibility Complex and Immunology of Transplantation
· Immunodeficiencies. Acquired immune deficiency syndrome (AIDS)
· Autoimmunity.
· Hypersensitivity immune reactions.
· Cancer and the Immune System. Cancer Immunotherapy</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>• “Kuby’s Immunology”, Jenni Punt; Sharon Stranford; Patricia Jones; Judy Owen. 8th Edition (2019), Macmillan
• “Janeway's Immunobiology”, K, Murray and C. Weaver, 9th Edition (2017), Garland
• “Cellular and Molecular Immunology” Abul Abbas, Andrew Lichtman, Shiv Pillai. 10th Edition (2021), Elsevier</td></tr>
<tr><td>Assessment</td><td>Exams 70%
Assignments/Lab 20%
Class Participation and Attendance 10%
100%</td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Elements of Botany				
Course Code	PHA215				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year /3rd Semester				
Teacher's Name	Dr. Constantinos Nikiforou/Mrs Iro Kouzali				
ECTS	6	Lectures / week	2hrs/14 weaks	Laboratories / week	2hrs/ 14 weeks
Course Purpose and Objectives	This course aims to familiarize students with the plant kingdom and with the classification - phylogeny of plants, the structural elements of plant cells and their basic functions and finally to understand the morphological, anatomical and physiological characteristics of plant tissues and organs.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Describe the structure of the plant cells and each of the individual organelle. • Recall the structure and morphology of plant tissues. • Describe plant organs. • Determine and explain the main processes in plants such as photosynthesis, respiration, transpiration, reproduction and growth. • Recognize the taxonomic groups of plants and botanical characteristics that are used for their classification. • Recognize the definition of species, population and endemism in plants. • Describe and compare cryptogams with gymnosperm and angiosperm plants.				
Prerequisites	None	Co-requisites	None		

Course Content	**Theory:** • Introduction to the plant kingdom. Evolution of plants. • Relations between botany and pharmacognosy. • Biosynthetic pathways of the main categories of primary and secondary metabolites in plants. • The plant cell. Organelles. • Plant tissues. • Plant organs. Plant anatomy and physiology. Stem, root, leaf, flower, seed and fruit. • Main processes in higher plants such as photosynthesis, respiration, transpiration, reproduction and growth. • Classification. Botanical characteristics used for taxonomy classification in plants. Definitions of species, population and endemism. • Cryptogams (algae, lichens, bryophytes, pteridophyta). • Classification, botanical description, reproduction strategies, role in ecosystems and economic impact. • Gymnosperms: Classification, phylogenetic taxonomy, morphological characteristics, study of main families and species, role in ecosystems and economic impact. • Angiosperms. Description, classification, phylogenetic taxonomy, botanical description, roles in ecosystems and economic importance of main groups, classes, families and species. • Endemics, ornamental and pharmaceutical plants of Cyprus. **Laboratory:** • Characteristics of plants used in taxonomy and microscopic identification of plant structures. • Describe and prepare herbarium specimens. Correct usage of taxonomy books. • The plant cell-organelles. • Plant tissues. • Plant organs: anatomy of stem, root, leaf, seed and fruit. • Leaves categories and phyllotaxis. • Anatomy and morphology of flower, floral symmetry, inflorescences. • Fruits categories. • Cryptogams. • Gymnosperms. • Angiosperms. • Study of the main families of pharmaceutical plants.
Teaching Methodology	Face- to- face
Bibliography	General Botany. Aivalakis G., Fasseas C., Karabourniotis G., 2005, Embryo Publications, ISBN: 9608002346 (the most recent version).

	Botany-Morphology Plant Anatomy - Volume 1. Bozabalidis A., 2011, University Studio Press, ISBN: 978-960-12-2047-5 (the most recent version). Botany: Cytology-Anatomy and Plant Morphology. Vlachos I., 2005, Ion Publications, ISBN: 978-960-411-5457 (the most recent version). Plant Systematics - Phylogenetic - Phenomenal Approach to the Classification of Plant Organisms. Babalona D., Kokkini S., 2014, Aivazi Publications, ISBN: 960-86090-3-8 (the most recent version). Plant Systematics – Volumes A and B. Stefanaki-Nikiforaki M., 1999, Stamoulis Publications, ISBN 960-351-261-3/960-351-262-1 (the most recent version). Plants. Ridge I., 2005, Ion Publications. ISBN: 9789604115228 (the most recent version). Manual of botany laboratory, Vlachos I., 2001. Ion Publications, ISBN: 960-411-178-7(the most recent version).
Assessment	Exams 60% Assignments/Lab 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	English Medical Terminology and Literacy				
Course Code	EHL200				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year /3rd Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3hrs/14 weeks	Laboratories / week	None
Course Purpose and Objectives	The aim of the course is to enable Pharmacy students to improve communication competence in English at the B2 CEFR level in their field of study. The course focusses on improving the four language skills—speaking, listening, reading and writing—with emphasis on contexts related to Pharmacy.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • recognize and comprehend Pharmacy and medical terminology used in related contexts • demonstrate language skills in the context of Pharmacy and Health Sciences at the B2 CEFR level • process texts in the domains of pharmacy and Health Sciences • assimilate and respond to listening material related to Pharmacy and healthcare • compose short pieces of writing related to pharmacy and Health Sciences • improve their reading skills in English by studying a variety of scholarly and non-scholarly literature related to their discipline				
Prerequisites	English Placement Test	Co-requisites	None		
Course Content	The course develops students' communication competence in Pharmacy and other Health and Life Sciences contexts. Focus is given on analysing and reviewing a variety of aural and written materials of scientific content related to their field of study and also on developing the skill of oral and written language production. Some of the topics covered include: *Introduction to pharmacy and medical terminology used in related contexts* • Medically-related prefixes/suffixes/roots • Term formation • Spelling words derived from Greek and Latin • Greek and Latin plurals • Pronunciation rules				

	Description of structure and function of anatomical parts as well as shapes, location and properties of various organs and structures in the human body within related contexts • Anatomical terms • Layperson's and medical terms • Greek and Latin noun suffixes • Locative prefixes • Locative prepositions *Medical terms of common illnesses, types of medication and medical interventions* *Grammatical structures found in medical/pharmaceutical contexts including:* • Tenses • Active and Passive Voice • Relative clauses • Articles • Prepositions • Indirect speech • Secondary clauses *Analysis of medical/healthcare authentic and nonauthentic written texts* *Composition of short written assignments such as instructions, emails, letters and reports related to pharmacy and other healthcare contexts*
Teaching Methodology	Face- to- face
Bibliography	*Career Paths: Medical.* Virginia Evans, Jenny Dooley, Trang M. Tran MD. Express Publishers. 2012 *Αγγλική ορολογία για επιστήμονες υγείας*, Γιώργος Ι. Πανουτσόπουλος, ΔΙΣΙΓΜΑ ΕΚΔΟΣΕΙΣ, 2016 *English for Medicine in Higher Education Studies*, Patrick Fitzgerald, Marie McCullagh, Ros Wright, Terry Phillips, Εκδόσεις Ανδρέας Μπέτσης, 2010 Other material given by the instructor
Assessment	Exams 60% Assignments/ Class Participation and Attendance 30% 10% 100%
Language	English

Course Title	Drug Design and Development				
Course Code	PHA230				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year/ 4th Semester				
Teacher's Name	Dr. Panayiota Christodoulou				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	1hr/ 14 weeks
Course Purpose and Objectives	'Drug Design and Development' course aims to present the basic methods that are used to design new drugs, available tools (molecular modeling software, spectroscopy, etc.) as well as the steps that are required to develop and approve new drugs. In addition, the course includes the analysis of issues related to intellectual property, existing legislation and the importance of drug Organization.				
Learning Outcomes	Upon successful completion of the course, students will be able to: - Apply the basic principles for the discovery, design and the development of new drugs. - Recognize the importance of action-structure quantity relationship in new drug molecules design. - Describe the use of molecular modeling software and its applications in new drug design. - Analyze the procedure of development and approval of new drugs.				
Prerequisites	None	Co-requisites	None		
Course Content	<u>Theory</u> - Introduction, historical background, prehistory. natural products. synthetic products. the need to regulate and develop a regulatory framework. - The stages of design and development of new drugs. The cost of developing new drugs. - Opportunities and challenges, target based design, phenotype based design, mixed approach. - Drug macromolecule interaction: Drug molecular targets: proteins (structure analysis), contribution of technicians: X-rays crystallography and spectroscopy NMR. - Enzymes – Michaelis Menten, enzymatic inhibition. - Receptors (types, ligaments, connection theories). - Drug design and metabolism – Prodrugs. - Drug design and metabolism – ADME. - Introduction in molecular interactions and Molecular Dynamics, Structure and Molecular Variability, Molecular Libraries.				

	- Discovery techniques SBDD, LBDD, FBDD, CADD. - Optimisation of lead compound, Quantitative structure-action relationships, linear and non-linear equations, statistical principles and physicochemical parameters, Part II. - Development and approval of new drugs, development of new biological and genomic products, preclinical studies, formulation and optimisation, the stages of clinical development, the procedures for authorizing the marketing of the drug, the drug organisations ΕΟΦ, EMA, FDA and their role in new drug approval. Characteristics of GLP, GCP και GMP rules and their importance in new drug approval and development. Laboratory - Software ChemScketch, MedChem Designer and use of SMILES. - Webpage Molinspiration. - Use of the PDB. Ramachadran Plots. - Calculations of Km, Lineweaver Burk, types of inhibition, Ki measurement of enzyme inhibition. - Calculation of binding to receptors and of response. Interpretation of pharmacodynamics response graphs. - Drug Data Bank, Lipinski Rule of 5. - Software ADMETSAR. - Prediction of metabolites. - Calculation of molecular similarity. - Design of new binding molecules using the software SeeSAR.
Teaching Methodology	Face- to- face
Bibliography	Φαρμακοχημεία Κόκοτος, Γεώργιος-Ισίδωρος Μαγκριώτη, Βικτωρία Αποθετήριο Κάλλιπος: https://repository.kallipos.gr/handle/11419/1923 Download: https://repository.kallipos.gr/bitstream/11419/1923/1/00_master%20document.pdf Βασικές αρχές σχεδιασμού και ανάπτυξης φαρμάκων, Δημόπουλος, Βασίλειος, Τσαντίλη-Κακουλίδου, Άννα Σχεδιασμός φαρμάκων, Φαρμακοχημεία, Φαρμακευτική χημεία, Αποθετήριο Κάλλιπος: https://repository.kallipos.gr/handle/11419/5881 Download: https://repository.kallipos.gr/bitstream/11419/5881/5/00_master_document_Nov.pdf New Drug Development: Design, Methodology, and Analysis J. Rick Turner John Wiley & Sons, 2007. «Οργανική Φαρμακευτική Χημεία, Θέματα Φαρμακοχημείας-Σχεδιασμού φαρμάκων», Ε.Α. Ρεκκα, Π.Ν. Κουρουνάκης, Εκδ. Φ. Χατζηπάντου, Θεσσαλονίκη 2010. Smith, H.J. Williams H, Eds, Introduction to the Principles of Drug Design, Wright, Boston.

	Cohen, N. R. (Ed.), Guidebook on Molecular Modeling in Drug Design, Academic Press, San Diego. Martin Y.C., Quantitative Drug Design, Dekker, New York. Webpages: www.ema.europa.eu, www.fda.gov
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Analytical Chemistry				
Course Code	PHA235				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year/4th Semester				
Teacher's Name	Dr. Ioannis Stavrou / Dr. Andreas Kourtellaris				
ECTS	6	Lectures / week	3hrs/14 weeks	Laboratories / week	2hrs/14 weeks
Course Purpose and Objectives	The main aim of this course is understanding the main principles of Analytical Chemistry. Understanding the role of the Analytical Chemist and the scientific method for presenting the analytical results. Presentation of basic techniques of Quantitative and Qualitative Analysis and their applications and to familiarize students with basic quantitative analytical procedures which are applied in pharmaceutical analysis.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Define the introductory concepts of Analytical Chemistry: qualitative and quantitative analysis, chemical analysis methods. • Describe various types of solutions, the factors affecting the solubility, the properties of water as solvent, the properties of aqueous electrolyte solutions, and the nature of acids, bases and salts in aqueous solutions. • Describe the rules for writing chemical equations in aqueous solutions, the categories of chemical reactions, the common reducing and oxidizing agents and balancing chemical equations. • Solve concentration problems. • Define the factors affecting the rate of chemical reaction and the chemical equilibrium. • Apply quantitatively the law of chemical equilibrium: on weak acid equilibria, weak base equilibria, self-ionization of water, buffer solutions, complex ion equilibria, and redox equilibria. • Describe the principles of titrations. Acid-base titrations, precipitation titrations, complexometric titrations. • Apply the safety rules of the chemistry laboratory. • Prepare samples and solutions. • Use sampling procedures and analyse pharmaceutical compounds. • Apply basic techniques of quantitative analysis for the determination of known and unknown solutions. • Apply titrimetric and complexometric techniques of analysis.				
Prerequisites	PHA135	Co-requisites	None		

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<tr><td>Course Content</td><td>

Introductory concepts of analytical chemistry: qualitative and quantitative analysis, chemical analysis methods.
Errors and Statistical processing of analytical data.
Solutions, factors affecting the solubility, properties of water as solvent, properties of electrolytes, acids, bases, salts.
Rules for writing chemical equations, categories of chemical reactions, common reducing and oxidizing agents, methods of balancing redox reactions.
Solve concentration problems. Ways of expressing concentration, units of concentrations, activity (active concentration), mass and charge balances.
Rate of reaction and chemical equilibrium. Law of chemical equilibrium, weak acid equilibria, weak base equilibria, self-ionization of water, buffer solutions, complex ion equilibria, and redox equilibria.
Titrations. Stoichiometry. Errors.
Acid-base titrations, Non-aqueous titrations, precipitation titrations, complexometric titrations. Titration curve analysis.

Lab exercises

Preparation of solutions with known concentration.
Analytical burette calibration and errors.
Acid-base titrations
Redox titrations
Precipitation titrations
Complexometric titrations
Automation of analytical techniques

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<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Quantitative Chemical Analysis (7E 2006 ISBN 9780716770411) Daniel C. Harris

G. Svehla, Vogel's Qualitative Inorganic Analysis, Prentice Hall, 7 ed., 1979.

J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas, Vogel’s Quantitative Chemical Analysis, Pearson Education, UK, 1989.

Θ. Π. Χατζηϊωάννου, Α. Κ. Καλοκαιρινός, Μ. Τιμοθέου-Ποταμιά, Ποσοτική Ανάλυση, Αθήνα, 2006.

Θ. Π. Χατζηϊωάννου, Χημική Ισορροπία και Ανόργανη Ποιοτική Ημιμικροανάλυση, Αθήνα, 2003 ISBN 960-220-751-5, ISBN-13 978-960-220-751-2</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Pharmacognosy I				
Course Code	PHA240				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year/4th Semester				
Teacher's Name	Dr. Constantinos Nikiforou				
ECTS	3	Lectures / week	2hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	This course aims to familiarize students with the basic principles of Pharmacognosy, the production of bioactive products by plants, the categories of natural bioactive substances and their phytochemical characteristics. Moreover, this course explains methods such as isolation, identification and tests for natural bioactive substances and analyses their basic applications in therapeutics.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Explain the origin of drugs from natural sources. • Identify the concepts of ethnobotany and ethnopharmacology and know the geographical distribution of the most important medicinal plants. • Recognize the bioactive natural chemical compounds. • Describe the action and use of the plant products and their main active constituents. • Determine and explain the relationship between chemical characteristics of natural drugs and their biological-therapeutic actions. • Identify the origin, the properties and the bioactivity of important natural products. • Describe the role of natural products which are used as a guide in the design and the development of new drugs.				
Prerequisites	PHA215	Co-requisites	None		
Course Content	**Theory:** • Categories and production of natural bioactive products. • Ethnobotany and ethnopharmacology. • Systematic classification of medicinal plants. • Plant cell and tissue cultures for the production of bioactive substances. • Connection between chemical structure, physicochemical properties and biological activity of natural products. • Poisons, toxins, toxic fungi and antibiotic medicines from natural sources. • Isolation and purification methods for phytochemicals. Phytochemical analysis - quality control. • Applications in pharmaceutical technology.				

	Assigments: • Educational excursion and/or field trip for harvesting medicinal and aromatic plants. • Plant cell and tissue culture project aiming to production and isolation of bioactive secondary metabolites. • Essential oil distillation method and thin layer chromatography (TLC). • Examination of antimicrobial activity of different plant extracts isolated from medicinal plants of Cyprus flora. • Investigation of antioxidant activity of plant extracts. • Growth of medicinal plants under controlled conditions. Qualitative and quantitative characteristics of their phytochemistry.
Teaching Methodology	Face- to- face
Bibliography	Pharmacognosy, Souleles N. C., 2000, ISBN: 9603170526, Pegasus Publications, Simoni A.-Chahjipantou F. O.E (the most recent version). Drugs of Natural Origin, Samuelsson G., 2005, Translation in Greek: Kordapatis P., Manesi-Zoupa E., Pairas G., ISBN-10:960-524-015-7, The University Press of Crete (the most recent version). Textbook of Pharmacognosy and Phytochemistry, Avinash Seth Biren Shah, 2009, e book ISBN: 9788131232606, Elsevier India Fundamentals of Pharmacognosy and Phytotherapy, Heinrich M., Barnes J., Prieto-Garcia J., Gibbons S., Williamson E., 3rd Edition, 2018, ISBN:9780702070082, Elsevier (the most recent version). Drugs of Natural Origin: A Treatise of Pharmacognosy, Sixth Revised Edition, 2010, Samuelson G. and Bohlin L., ISBN: 978-91-976510-5-9, Swedish Pharmaceutical Press (the most recent version).
Assessment	Exams 70% Assignments 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmaceutical Biotechnology				
Course Code	PHA250				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year/ 4th Semester				
Teacher's Name	Dr. Malamati Kourti				
ECTS	3	Lectures / week	2hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	Introduction to the basic principles and the most important applications of biotechnology, with particular emphasis on pharmaceutical biotechnology and its applications.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Analyze the biochemical and biological mechanisms underpinning biotechnological applications. • Identify food and pharmaceutical ingredients that have been derived from biotechnological processes and describe their value to humans along with their potential risks. • Describe the biotechnological applications for the manufacture of medicines as well as their financial importance.				
Prerequisites	PHA210	Co-requisites	None		
Course Content	• Introduction to biotechnology. Historical outline. Bioreactors. • Recombinant DNA technology/ other techniques. PCR. Protein analysis techniques. • Pharmaceutical proteins. Hematopoietic growth factors. Interleukins and Interferons. Insulin. Thrombolytic factors. • Transgenic animals and plants. Biopharming. Knock-out and CRISPR-Cas9 technologies. Edible vaccines. Plantibodies. • Monoclonal Antibodies for organ transplantations, cancer, chronic inflammatory diseases. • Vaccines. Traditional vaccines. Modern vaccines. Therapeutic vaccines. • Applications of enzyme properties in biotechnology. Legislation. Medicinal enzyme applications. • -omics technologies. Genomics. Transcriptomics. Proteomics. Metabolomics/ Metabonomics. Pharmacogenomics/ Pharmacogenetics. Personalized medicine. • Safety issues in biotechnology. Biosimilars. Bioethics.				
Teaching Methodology	Face-to-face				

Bibliography	Crommelin D, Sindelar R, Meibohm B, Pharmaceutical Biotechnology (3rd edition), Parisianou, 2011. P. Prave, U. Faust, W. Sittig, D.A. Sukatsch, Basic Biotechnology. A student's guide, VCH Publications, 1987. G. Walsh, Pharmaceutical Biotechnology: Concepts and Applications (1st edition), Wiley, 2007. Ratledge C, Kristiansen B, Basic biotechnology (2nd edition), Cambridge University Press, 2001. Kyriakidis DA, Biotechnology, Zitis Publications, 2000.
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Biochemistry				
Course Code	PHA255				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	2nd Year /4th Semester				
Teacher's Name	Dr. Antonia Sophocleous				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	2hrs/ 14 weeks
Course Purpose and Objectives	The purpose of this course is to introduce students to the structures and function of basic biomolecules that make up the living organisms. The student also learn the basic principles of bioenergy and the main metabolic pathways carried out in a eukaryotic cell (with emphasis on the metabolic pathways of energy metabolism). The laboratory part aims for the students to practice techniques of analysis of biomolecules.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Recognize, classify, write and name the basic biomolecules, • Define the basic mechanisms of operation of biomolecules and describe their structure-function relationship, • Recognize the concept of metabolism (anabolism-catabolism) and how it leads to cell and organism homeostasis, • Apply basic principles of thermodynamics to biochemical reactions of metabolism, • Recall the metabolic pathways of the biomolecules, • Describe the basic metabolic pathways through which a cell exploits its macronutrients, • Describe the biochemistry of DNA, plasmids and applies their biochemical isolation techniques, • Apply basic laboratory techniques of qualitative and quantitative analysis of proteins and lipids, • Prepare solutions and determine their concentration with the use of the spectrophotometer, • Discuss the general principles of enzymology and the importance of enzymes as essential molecules in cellular metabolism.				
Prerequisites	PHA125		Co-requisites	None	
Course Content	Theory: Proteins, carbohydrates and lipids. Description of the biological functions of these biomolecules based on their chemical properties and their three				

	dimensional structures and the presentation of laboratory methods and techniques for their isolation, identification and characterization. Proteins - structure and function. Hemoglobin - structure, function and human genetic diseases associated with hemoglobin chains. Enzymes - mechanisms of enzymatic action, enzyme catalyzing kinetics, regulation. Sugars and polysaccharides. Lipids and Biological Membranes. Metabolism - overview of principles of thermodynamics, function and regulation of metabolic pathways, glycolysis, gluconeogenesis, Krebs cycle, electron transport chain and oxidative phosphorylation, lipid metabolism, cholesterol metabolism, interaction between metabolic pathways, hormonal action. Signal Transduction: Receptors, G proteins, second messenger molecules and intracellular pathways. Receptors linked to enzymes and their intracellular pathways. <u>Laboratory:</u> Laboratory exercises: Proteins, carbohydrates and lipids: Techniques for their isolation, identification and characterization. Electrophoretic techniques. Enzyme kinetics
Teaching Methodology	Face- to- face
Bibliography	Lubert Stryer, Jeremy M. Berg, John L. Tymoczko, Biochemistry (5th Edition), W.H. Freeman, 2005. Nelson DL, Cox MM, Lehninger, Principles of Biochemistry (4th Edition), W.H. Freeman, 2005. Nelson DL, COX MM, Παπαβασιλείου ΑΓ (επιμ.), Lehninger Βασικές Αρχές Βιοχημείας Τόμοι I, II (1η Έκδοση), Εκδόσεις Πασχαλίδη, 2007. Robert K. Murray, Darryl K. Granner, Peter A. Mayes, Victor W. Rodwell, Harper's, Illustrated Biochemistry (26th Edition), McGraw-Hill Medical, 2003. Thomas M. Devlin, Textbook of Biochemistry with Clinical Correlations (5th Edition), Wiley-Liss, 2001.
Assessment	Exams 60% Assignments/Lab 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Biopharmaceutics and Pharmacokinetics				
Course Code	PHA300				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3th Year/ 5th Semester				
Teacher's Name	Dr. Athanasios Metaxas				
ECTS	6	Lectures / weeks	3hrs /14 weeks	Laboratories / weeks	2hrs /14 weeks
Course Purpose and Objectives	The course describes the basic principles of Biopharmaceutics and Pharmacokinetics. It provides an analysis of the stages involved during the transitioning of a drug from its release into the body up to its elimination from the body. Biopharmaceutics examines the interrelationship of the physical/chemical properties of the drug, the dosage form (drug product) in which the drug is given, and the route of administration on the rate and extent of systemic drug absorption. Pharmacokinetics studies the processes of absorption, distribution, metabolism, and excretion as a mathematical function of time and concentration.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Discuss the processes that take place upon the arrival of drugs in the general circulation • Identify the correlation between the physicochemical properties of various drugs and formulations with their *in vivo* absorption pathways • Explain the importance of bioequivalence studies for the development of new formulations • Explain the importance of biopharmaceutical controls in quality control measures • Apply mathematical models that describe the processes of absorption, distribution and elimination • Explain the concepts of volume of distribution, clearance & half-life • Calculate the pharmacokinetic parameters of simple dosing regimens • Evaluate the suitability of simple dosing regimens • Discuss the basic routes of drug elimination • Use pharmacokinetic parameters in the context of therapeutic drug monitoring				
Prerequisites	HEA 120		Co-requisites	None	

Course Content	THEORY • Introduction: Definitions and basic concepts of Biopharmaceutics & Pharmacokinetics. Description of a drug's journey in the body, from drug administration to the manifestation of pharmacological effect. Introduction to the concepts of distribution & elimination: volume of distribution, clearance, half-life. • Routes of drug administration, genetic basis of differences in Pharmacokinetic - Pharmacodynamic processes. • Basic mathematics in Biopharmaceutics & Pharmacokinetics. • Drug absorption after *per os* administration: from the formulation to the gastrointestinal fluids, the drug in the environment of the gastrointestinal tract, the drug from the gastrointestinal tract to the general circulation. • Physicochemical & Physiological factors that affect the distribution of drugs (biopharmaceutical drug design parameters). • Biopharmaceutical controls: disintegration, dissolution, permeability. Biopharmaceutics classification system BCS. • Bioavailability & Bioequivalence: Basic concepts. • The importance of visualizing drug plasma concentration vs. time curves. • Basic pharmacokinetic models & compartmental modelling: the concept of the one- and two-compartment distribution models. • One-compartment model: rapid intravenous administration & intravenous infusion. • *Per os* drug administration. • Repeated administration, intravenous and oral. • Elimination (drug clearance, renal excretion, hepatic excretion - biotransformation, Michaelis-Menten kinetics). • Calculation of pharmacokinetic parameters by parametric and non-parametric methodology. LABORATORY / WORKSHOP *Data Analysis* • Processing *in vitro* dissolution data: calculation of distinctive parameters based on experimental data sets. • *In vitro - in vivo* correlations for orally administered drugs. • Processing results of bioequivalence studies. • Software-based calculation of pharmacokinetic parameters from blood drug concentration vs. time data. *Dissolution of Orally Administered Solid Pharmacotechnical Forms* • Dissolution tests and between-form comparisons. • Influence of dissolution medium pH on the rate of dissolution of a pharmaceutical substance in immediate release tablets. *Solubility of Pharmaceutical Substances* • Determination of partition coefficients. • Definition of saturation solubility of a pharmaceutical substance.

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- Increase of saturation solubility through the influence of b-cyclodextrine on saturation solubility.

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<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>Shargel & Yu’s (editors): Applied Biopharmaceutics & Pharmacokinetics, McGraw Hill (latest edition)

Donald J Birkett and Australian Prescriber: Pharmacokinetics made easy, McGraw Hill (2010)

Derendorf H, Schmidt S: Rowland and Tozer’s Clinical Pharmacokinetics and Pharmacodynamics (Fifth Edition), Wolters Kluwer (2020)

Patrick J Sinko (editor): Martin's physical pharmacy and pharmaceutical sciences: physical chemical and biopharmaceutical principles in the pharmaceutical sciences, Wolters Kluwer (latest edition)

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Course Title	Molecular and Biochemical Pharmacology				
Course Code	PHA305				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3rd Year/5th Semester				
Teacher's Name	Dr. Malamati Kourti				
ECTS	6	Lectures / week	3hrs/14 weeks	Laboratories / week	None
Course Purpose and Objectives	This course offers the students a complete and easy introduction to the rapidly evolving field of Molecular Pharmacology. A modern approach to the activity of drugs depending on their molecular targets rather than the traditional approach depending on the targeted organs is provided. The ultimate goal is the understanding from a chemical, molecular and biochemical point of view, of the activity of drugs and the methods of rational design for the development of new compounds.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Recognize the interaction between a drug and its receptor as a prerequisite for its pharmacological activity • Describe the main types of receptors and their mechanisms of interaction with different types of drugs • Categorize drugs according to their action in agonists, antagonists, inverse agonists, partial agonists • Analyze dose-response curves and draw useful conclusions about the efficacy, potency and safety of drugs • Analyze the molecular mechanisms of action of main drug categories				
Prerequisites	PHA255	Co-requisites	None		
Course Content	Introduction • Dose-response curves • Molecular mechanisms of action of drugs: Action via physicochemical properties, Action via ion transport systems, Action via enzyme inhibition, Action via receptors, Other mechanisms of action • Classical approaches for the study of interactions between receptors and drugs • Historical context • Correlation models between agonist concentration, receptor binding and tissue response Pharmacodynamics • Constitutively active receptors and inverse agonists • Drug-receptor interaction				

	• Decreased drug response • Agonists and mechanisms of stimulation-response • Direct agonists • Indirect agonists • Antagonists • Types of drug antagonisms • Pharmacological antagonism Pharmacokinetics Types of receptors: Intracellular receptors, Membrane receptors, Signal transduction systems Receptors ion channels • Voltage-gated ion channels • Ligand-gated ion channels • Mechanically-gated ion channels • Pharmacological applications G-protein coupled receptors • GPCR families • Interaction of agonists and antagonists with GPCRs • Activation and desensitization mechanisms of GPCRs • Families of G-proteins: Heterotrimeric, Small GTPases Receptors with endogenous catalytic action • Receptors guanylate cyclases • Receptors serine-threonine kinases • Receptors phosphotyrosine phosphatases • Receptors tyrosine kinases • Receptors associated with tyrosine kinases Phospholipases and phospholipid kinases • Phospholipases • Phosphoinositide-3-kinase • Protein kinase C • Pharmacological applications Second messengers • Calcium ions • RyR and IP_3 receptors • Adenylyl cyclase, cyclic adenosine monophosphate, Protein kinase A, Downstream proteins, Phosphodiesterases • Guanylyl cyclase, cyclic guanosine monophosphate, Protein kinase G, Downstream proteins • Nitric oxide, NO synthases, Molecular targets and biological actions of NO • Pharmacological applications Anticancer drugs. Novel categories of anticancer drugs. Gene therapy • Vectors • Clinical trials • Pharmacology of gene therapy

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- Anti-sense oligonucleotides

Antioxidants

- Antioxidant enzymes
- Non-enzymatic antioxidant systems
- Oxidative stess
- Drugs against oxidative agents

Pharmacology of cytokines

- Categories of cytokines
- Cytokine receptors
- Therapeutic cytokines
- Cytokine agonists and antagonists

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<tr><td>Bibliography</td><td>Evaggelia Papadimitriou, Molecular Pharmacology, Parisianou 2010. A.E. ISBN: 978-960-394-609-02010

John Dickenson, Fiona Freeman, Chris Lloyd Mills, Christian Thode, Molecular Pharmacology: From DNA to Drug Discovery, 2013.

Terry Kenakin, Molecular Pharmacology: A Short Course, 1997.

M. Marselos, A. Antoniou, M. Constanti, Γ. Leontaritis, E. Manolopoulos, Π. Pappas, Π. Charkitis, Biochemical Pharmacology-Mechanisms of action of drugs, 2015.</td></tr>
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Course Title	Pharmaceutical Chemistry I				
Course Code	PHA310				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3rd Year/ 5th Semester				
Teacher's Name	Dr. Andreas Kalogirou				
ECTS	6	Lectures / week	3hrs/14 weeks	Laboratories / week	None
Course Purpose and Objectives	The purpose of this course is to deepen the knowledge of the student in the chemistry of drugs that involves the procedures of synthetic or hemisynthetic preparation of drug molecules with known methods of the international literature, that leads to their exact chemical structure, as well as their chemical and physicochemical properties that make their analytical and pharmacological identity.				
Learning Outcomes	Upon successful completion of the course, students will be able to: -Determine the structure and activity of drug molecules in relation to their therapeutic category, -Analyze the importance of functional groups to interpret their mode of action, -Recognize the importance of stereochemistry and supramolecular interactions in the pharmacological action, -Describe the synthesis of drug molecules, -Describe basic pharmacokinetic properties of drug molecules based on their structure.				
Prerequisites	PHA205	Co-requisites	None		
Course Content	Chemical bonds, their strength and importance for activity. The importance of the structure of proteins and DNA in the activity of drugs. Absorption, Distribution, Metabolism and Excretion. Structure-Activity Relationship and drug design. Functional groups found in drug molecules: Hydrocarbons, amines, neutral and acidic compounds containing nitrogen, compounds with functional groups containing oxygen and sulfur. Sorting, synthesis, stereochemistry, mechanism of action, structure activity relationship, metabolism, indications and side effects in the main groups of drugs. Drugs with action on the adrenergic system. Drugs with non-adrenergic actions in the heart and blood vessels. Drugs with action of the cholinergic system. Drugs that act on enzymes. Central nervous systems suppressants.				

Teaching Methodology	Face- to- face
Bibliography	Φαρμακοχημεία, Κόκοτος Γ., Μαγκριώτη Β. available free of charge in the address: https://repository.kallipos.gr/handle/11419/1923 An introduction to Medicinal Chemistry, 5e (Paperback) by Graham L. Patrick. Pharmaceutical Chemistry, 1e (Paperback) by David G. Watson BSc PhD PGCE Essentials of Pharmaceutical Chemistry (Paperback) by Donald Cairns. Foye's Principles of Medicinal Chemistry [Hardcover] David A. Williams PhD
Assessment	Exams 80% Assignments/Lab 10% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmaceutical Technology I				
Course Code	PHA315				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3rd Year/ 5th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	2 hrs/ 14 weeks	Laboratories / week	1hr/ 14 weeks
Course Purpose and Objectives	The course aims to provide the students with the necessary knowledge on Pharmaceutical Technology processes through which the pharmaceutical raw materials are being transformed into drug dosage forms, enter the body, and reach the tissue targets. In addition, the basic principles of drug release mechanisms from the various drug formulations are discussed. The categorization of pharmaceutical dosage forms according to the various administration routes as well as their physicochemical characteristics are being analyzed. Moreover, pre-formulation and formulation of drug dosage forms, the scaling-up of formulations and other related issues are discussed. Finally, the solid and liquid dosage forms are deeply studied.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Define the meaning of pharmaceutical dosage form • Analyze the differences of formulations according to the route of administration • Describe the mechanisms of API release from the various formulations • Apply the basic principles of designing new formulations • Analyze the role and specifications of packaging materials • Describe the manufacturing process, the role of the excipients and the quality controls of the pharmaceutical forms				
Prerequisites	PHA130	Co-requisites	None		
Course Content	**Theory:** **Introduction** The design and operation of pharmaceutical industry. Design and manufacture of drug dosage forms. Drug development issues (biopharmaceutical, therapeutic and other aspects during dosage forms design). Pre-formulation, prototype development, scale up studies, regulatory issues, intellectual property. Process optimization and validation during dosage forms development by applying Design of experiments, Quality by Design and statistical analysis (e.g. ANOVA, Plackett-Burman, first-order designs etc). Production and product licenses. Types of Pharmaceutical dosage forms.				

	Pre-formulation Physico-chemical characteristics of ingredients - Interactions between components **Basic pharmaceutical manufacturing process** Particle properties related to solid dosage forms (e.g., particle size, size distribution, flow, etc.), measurement methods and equipment used. **Crystallization-Mechanism**, methods, and devices. **Reduction in size** - Mechanism, properties of materials that affect, energy vision, special cases. Size of particles obtained and changes during milling. **Mechanical particle separations** - Methods, Estimation of Efficiency. **Mixing Powders** - Mechanism of random mixing and interacting components. Types, characteristics, and function of mixers. **Drying - Definitions.** Measurement of humidity. Drying theory-Dryer types. Lyophilization. **Stability of pharmaceuticals** Stability - Shelf life - Forms of stability - Stability of Pharmaceutical Dosage Forms – Expiry Date of Pharmaceutical Dosage Forms **Solid dosage forms (Tablets, Capsules, Lozenges).** Basic Properties of solid dosage forms. Constituents, formulation, properties. **Tablets** Tablet ingredients / Excipients – Dry-Wet Granulation – Types of Tablets - Tablet Manufacturing - Tablet Control Tests - Tablet Defects - Tablet Coating **Capsules** Types of Capsules: Hard - Soft Capsules - Capsule Preparation - Capsule Control Tests **Controlled- and sustained- release solid dosage forms:** matrix systems and reservoir systems **Pharmaceutical solutions** Aqueous and non-aqueous pharmaceutical solutions; Pharmaceutical buffer solutions **Syrups** Syrup Ingredients- Types of Syrups – Pharmaceutical Syrup Preparation- Pharmaceutical Syrup Controls **Laboratory Exercises:** Powder mixing and sieving- Preparation of oral divided powders Size distribution

<table>
<tr><td></td><td>Preparation of effervescent granules and in-vitro disintegration analysis

Preparation of lozenges and in-vitro disintegration analysis

Tablet Manufacturing- Compliance testing

Preparation and quality control testing of solutions

Preparation and quality control testing of syrups</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Greek
Αυγουστάκης Κ. (2018). Φαρμακευτική Τεχνολογία-Βιομηχανική Φαρμακευτική, Τόμος Ι, Εκδόσεις Πανεπιστημίου Πατρών
Aulton, M. E., & Taylor, K. Επιμέλεια: Καχριμάνης Κ., Νικολακάκης Ι., Aulton Φαρμακευτική: Σχεδιασμός και Παρασκευή Φαρμάκων, Εκδόσεις Παρισιάνου Α.Ε. (Τελευταία έκδοση)
Παπαϊωάννου Γ., Δεμέτζος Κ., Βλάχου-Κωνσταντινίδου Μ. (2009). Φαρμακευτική Τεχνολογία Ι. Εκδόσεις Παρισιάνου Α.Ε. (Τελευταία έκδοση)
Σ. Μαλαματάρης (1995). Τεχνολογία Στερεών Φαρμακευτικών Μορφών. Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης (Τελευταία έκδοση)
Σ. Μαλαματάρης (2004) Τεχνολογία Υγρών και Στείρων Φαρμακευτικών Μορφών Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης (Τελευταία έκδοση)
English
Aulton, M. E., & Taylor, K. (2013). Aulton's pharmaceutics: The design and manufacture of medicines. Edinburgh: Churchill Livingstone/Elsevier.(4th edition)
Shayne Cox Gad PH.D., D.A.B.T.(2008) Pharmaceutical Manufacturing Handbook Production and Processes. John Wiley & Sons, Inc. (Latest edition)
Allen L.V. Jr., Popovich N. G., Ansel H.C., (2011). Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. Lippincott Williams & Wilkins (9th edition)
Williams R.O III, Watts Alan B., Miller Dave A. (2012). Formulating Poorly Water Soluble Drugs. AAPS Advances in the Pharmaceutical Sciences Series book series, Springer (2nd Edition)
Durivage M.A. (2016). The Certified Pharmaceutical GMP Professional Handbook. Quality Press (2nd Edition)
Gaisford S., Saunders M. (2013) Essentials of Pharmaceutical Preformulation. Wiley-Blackwell</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Examination</td><td>70%</td></tr><tr><td>Assignments/Lab</td><td>20%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
</table>

Language	Greek and English

Course Title	Pharmaceutical Analysis and Quality Control I				
Course Code	PHA320				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3rd Year/ 6th Semester				
Teacher's Name	Dr. Ioannis Stavrou				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	1hr/ 14 weeks
Course Purpose and Objectives	The aim of this course is to teach students the main principles of analytical methods that are used to identify and quantify drug molecules in pharmaceutical formulations. Over the course, students can understand the basic characteristics of drug quality and the processes used for the identification of drugs, their purity control and the quantitative determination of various medicines in pharmaceutical formulations, as described extensively in various Pharmacopoeias. Moreover, the course helps the student to carry out laboratory procedures correctly, apply appropriate methods of analysis, and understand the experimental data.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Recall the basic quality controls of the active substances described in the pharmacopoeias • Identify the basic reactions used to identify some common functional groups of pharmaceutical compounds • Define and evaluate the quality characteristics of the analytical methods • Describe and implement the techniques of chemical and volumetric analysis • Describe the instrumentation, principles, quality characteristics and basic applications of the most important spectroscopic analytical methods used in Pharmaceutical Analysis • Describe instrumentation, the principles, quality characteristics and basic applications of the most important chromatographic analytical methods used in Pharmaceutical Analysis. • Explain how to conduct stability studies. • Interpret the data obtained from analysis, analyze quantitatively and qualitatively different compounds in samples.				
Prerequisites	PHA235	Co-requisites	None		
Course Content	• **Introduction to Control of Pharmaceuticals:** Identification tests. Impurity tests. Assay tests. Pharmacopoeia tests. • **Control of the quality of analytical methods:** Errors, Accuracy and precision, Validation of analytical procedures, Standard operating procedure (SOP) Basic calculations.				

	• **Physical and Chemical Properties of Drug Compounds:** Calculation of pH values of aqueous solutions. Buffer solutions. Ionization of drug molecules. Hydrolysis of salts. Activity, ionic strength and dielectric constant. Partition coefficient, drug stability, stereochemistry of drugs. Measurement of optical rotation. Profile of physicochemical properties of certain drug compounds. • **Titrimetric and chemical analysis methods:** Instrumentation. Direct titrations of acids / bases in aqueous phase. Titrations of salts of weak bases in mixed aqueous / nonaqueous media. Indirect (back) titrations in aqueous phase. Nonaqueous titrations. Argentometric titrations. Complexom etric titrations. Redox titrations. Iodometric titration. Pair ion titrations. Diazotization. Potentiometric titration, Karl-Fischer titration (end-point coulometric detection). Automation of wet chemical methods.Applications. • **Ultraviolet-Visible Absorption Spectrophotometry: Principles of Uv-Vis.** Factors govering absorption of radiation. Beer-Lambert Law. Instrumentation. Instrument calibration. UV spectra of some representative pharmaceutical compounds. Use of UV/Vis spectrophotometry for the determination of pKa values. Applications of UV spectrophotometry in pharmaceutical quantitative analysis. Differencespectrophotometry. Derivative spectra. Applications of UV/Vis Absorption Spectroscopy in preformulation. • **Infrared spectrophotometry (IR):** Principles of IR. Instrumentation.Sample preparations. Factors determining intensity and energy. Applications in structure determination. Examples of IR spectra of drug molecules. Near Infrared analysis. Examples of NIRA applications. • **Atomic Spectrophotometry:** Atomic Emission Spectrophotometry Instrumentation. Examples of AES, quantification. Interferences in AES. Atomic Absorption Spectrophotometry, instrumentation. Examples of assays using AAS, some examples of limit tests. Inductively Coupled Plasma Emission Spectroscopy. • **Molecular Emission Spectroscopy:** Fluorescence spectrophotometry. Molecules which exhibit fluorescence. Applications in pharmaceutical analysis. Raman Spectroscopy, instrumentation, applications. **LABORATORY** • Volumetric determination of active substances • Non-aqueous titration, • Diazotization titration • Spectrophotometric determination of active pharmaceutical ingredient by UV-Vis • Determination of Na / K in infusion solutions by atomic emission spectrophotometry.
Teaching Methodology	Face- to- face

Bibliography	Pharmaceutical Analysis, A Textbook for Pharmacy Students and Pharmaceutical Chemists, D. G. Watson, RuAngelie Erdada-Ebel, . Elsevier Health Sciences (latest ed.) Handbook of Pharmaceutical Analysis edited by Lena Ohannesian & Antony J. Streeter Marcel Dekker, Inc.2005. Laboratory Notes prepared by Dr. Ioannis Stavrou	
Assessment	Exams Assignments/Lab Class Participation and Attendance	70% 20% 10% 100%
Language	Greek and English	

Course Title	Pharmacology I				
Course Code	PHA330				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3rd Year/ 6th Semester				
Teacher's Name	Dr. Malamati Kourti				
ECTS	6	Lectures / week	2hrs/14 weeks	Laboratories / week	1hr/14 weeks
Course Purpose and Objectives	To provide students with the necessary knowledge about the pathophysiology of diseases, the activities, interactions and adverse effects of different classes of drugs, and the safe administration of medication. In the first part of the Pharmacology course students learn about pharmacodynamics, pharmacokinetics, therapeutics and prescriptions. In addition, different therapeutic categories of drugs are presented with emphasis on drugs of the peripheral nervous system and cardiovascular system.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Analyze the principles governing the action of drugs and the mechanisms by which drugs exert their action • Recognize specific therapeutic indications for the administration of drugs • Recall the most common side effects of the different classes of drugs • Describe elements of pharmacokinetics for different classes of drugs • Classify the mechanisms of interaction between drugs and the effects of interactions on drug concentration and/or effectiveness • Explain the importance of therapeutic drug monitoring for dosage adjustment in certain patient populations				
Prerequisites	PHA305	Co-requisites	None		
Course Content	<u>THEORY</u> • Revision of basic pharmacodynamic concepts and Introduction to Pharmacology I • Introduction to Drug interactions, Pharmacovigilance, Prescriptions • Autonomic nervous system • Cholinergic agonists, Cholinergic antagonists • Adrenergic agonists, Adrenergic antagonists • Drugs for Congestive heart failure • Antiarrhythmic drugs • Antianginal drugs				

<table>
<tr><td></td><td>

Antihypertensive drugs
Antihyperlipidemic drugs
Diuretics
Case-study based learning

LAB

Pharmacodynamics: Equilibrium binding studies

</td></tr>
<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>K. Whalen, Lippincott Illustrated Reviews: Pharmacology (latest edition), Wolters Kluwer 2018.

J.M. Ritter, R. Flower, G. Henderson, Y.K. Loke, D. MacEwan, H. Rang, Rang & Dale’s Pharmacology (latest edition), Elsevier 2020.

C. Page, B. Hoffman, M. Curtis, M. Walker, Integrated Pharmacology (latest edition), Elsevier 2006.

R. Seifert, Basic Knowledge of Pharmacology, Springer Nature, 2019.

M.M. Dale, D.G. Haylett, Rang and Dale’s Pharmacology Flashcards Updated Edition, Churchill Livingstone 2014.</td></tr>
<tr><td>Assessment</td><td>
<table>
<tr><td>Exams</td><td>70%</td></tr>
<tr><td>Assignments/Lab</td><td>20%</td></tr>
<tr><td>Class Participation and Attendance</td><td>10%</td></tr>
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</td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
</table>

Course Title	Pharmaceutical Chemistry II				
Course Code	PHA335				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3rd Year/ 6th Semester				
Teacher's Name	Dr. Andreas Kalogirou/Dr. Andreas Kourtellaris				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	3hrs/ 14 weeks
Course Purpose and Objectives	The purpose of this course is to deepen the knowledge of the student in the chemistry of drugs that involves the procedures of synthetic or hemisynthetic preparation of drug molecules with known methods of the international literature, that leads to their exact chemical structure, as well as their chemical and physicochemical properties that make their analytical and pharmacological identity. In the second part the study of the remaining pharmacotherapeutic categories is completed.				
Learning Outcomes	Upon successful completion of the course, students will be able to: -Determine the structure and activity of drug molecules in relation to their therapeutic category, -Analyze the importance of functional groups to interpret their mode of action, -Recognize the importance of stereochemistry and supramolecular interactions in the pharmacological action, -Describe and perform the synthesis of drug molecules, -Describe basic pharmacokinetic properties of drug molecules based on their structure.				
Prerequisites	PHA310	Co-requisites	None		
Course Content	Theory Sorting, synthesis, stereochemistry, mechanism of action, structure activity relationship, metabolism, indications and side effects in the main groups of drugs. Analgesics, Topical anesthetics, Antihistaminics, CNS stimulants and drugs with serotoninergic action, Drugs affecting hemostasis and thrombus formation, Drugs targeting the endocrine system, Anticancer drugs, Antibacterial drugs, Antifungal drugs, Antiviral drugs. Laboratory Synthesis of aspirin,				

	Synthesis of papaverin and its salt, Synthesis of paracetamol, Synthesis of p-ethoxyacetanilide, Synthesis of benzocaine, Synthesis of sulfanilamide, Synthesis of ethyl bromide, Determination of logP.
Teaching Methodology	Face- to- face
Bibliography	Φαρμακοχημεία, Κόκοτος Γ., Μαγκριώτη Β. available free of charge in the address: https://repository.kallipos.gr/handle/11419/1923 An introduction to Medicinal Chemistry, 5e (Paperback) by Graham L. Patrick. Pharmaceutical Chemistry, 1e (Paperback) by David G. Watson BSc PhD PGCE Essentials of Pharmaceutical Chemistry (Paperback) by Donald Cairns. Foye's Principles of Medicinal Chemistry [Hardcover] David A. Williams PhD
Assessment	Exams 60% Assignments/Lab 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmaceutical Technology II				
Course Code	PHA340				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	3rd Year /6th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	2hrs/ 14 weeks
Course Purpose and Objectives	The course aims to broaden the acquired knowledge on drug dosage design and manufacturing processes, focusing on the liquids (sterile and non-sterile) as well as semisolid drug dosage forms (e.g suppositories, ointments). In addition, Good Manufacturing Practices for pharmaceutical products and the design and implementation of cleanrooms in Pharmacy Industry are included. The different parameters affecting the stability of the emulsions and suspensions are mentioned. Finally, both conventional and novel drug formulations for ocular, nasal and transdermal administration as well as innovative methods such as micro- and nano-encapsulation are analyzed.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Define the meaning of the formulation • Recognize the differences in the formulations depending on the route of administration • Describe the drug release mechanisms from the various formulations • Apply the basic principles of designing new formulations • Analyze the role and specifications of packaging materials • Describe the manufacturing process, the role of the excipients and the quality control tests of the pharmaceutical dosage forms. • List the Good Manufacturing Practices applied in Pharmaceutical Industry • Understand new methods for the preparation of drug formulations				
Prerequisites	PHA315	Co-requisites	None		
Course Content	**Theory:** **Pharmaceutical Suspensions** Pharmaceutical Suspension Ingredients – Types of Pharmaceutical Suspensions – Preparation of Pharmaceutical Suspensions - Quality control tests of Pharmaceutical Suspensions **Pharmaceutical Emulsions** Pharmaceutical emulsion Ingredients - Types of Pharmaceutical emulsions – Preparation of Pharmaceutical emulsions - Quality control tests of Pharmaceutical emulsions **Pharmaceutical Ointments**				

	Pharmaceutical Ointments – Types of Pharmaceutical Ointments – Preparation of Pharmaceutical Ointments - Quality control tests of Pharmaceutical Ointments **Pharmaceutical aerosols** Introduction - Pharmaceutical Aerosol Ingredients – Types of Pharmaceutical Aerosols - Quality control tests of Pharmaceutical Aerosols **Ocular preparations** Introduction – Types – Preparation methods - Quality control tests **Injectable formulations** Introduction - Types of injectable preparations - Preparation of injectable formulations - Quality control tests of injectable formulations **Suppositories** Introduction – Types of Suppositories – Preparation of Suppositories - Quality control tests of Suppositories **Microencapsulation** Introduction - Methods of Preparation - Quality control tests of Microcapsules **Transdermal Drug Delivery Systems (TDDS)** Introduction - Methods of manufacture - Quality control tests of TDDS **Sterilization of pharmaceuticals and cosmetics** Introduction - Sterilization Methods - Testing the success of sterilization **International GMP specifications. Design and implementing of Pharmaceutical clean areas.** Quality control and standard operating procedure requirements. Analysis of the fundamentals of air filtration: principles of HEPA filtration and design of HEPA systems and ventilators. Systems of air classification Materials and Equipment for Clean-rooms Clean-room Practices. Critical control of clean-room entrance practices. Standard Operating Procedures for clean-room work. Clean-room test. Equipment and Monitoring **Conservation of pharmaceuticals and cosmetics** Introduction - Preservatives - Factors affecting the efficacy of preservatives **Packaging of pharmaceuticals and cosmetic products** Introduction – Types of Packaging - Packaging materials **Laboratory Exercises:** **1.** Improving drug solubility and stability via cyclodextrin complexation **2.** Simulation: Comparison of cumulative dissolution curves using the similarity index, f2. **3.** Preparation and quality control testing of suspensions **4.** Preparation and quality control testing of emulsions **5.** Preparation and quality controls of ointments **6.** Preparation of suppositories and testing of their melting time **7.** Preparation of ophthalmic ointments and gels and measurement of spreadability **8.** Preparation and sterility testing of sterile injectable solutions **9.** pH measurement, stability studies based on mass loss, appearance and pH differentiation, swelling ability studies of drug dosage forms **10.** Mandatory students' visits to Pharmaceutical Industries aiming to supplement their knowledge in the Design - Manufacture - Control - Distribution of the Drug, given that the laboratory exercises which

	the student performed during Laboratory of Pharmaceutical Technology I, II will be seen on an industrial scale. In addition, students will be familiar to processes such as lyophilization, sterilization, packaging, or distribution in Pharmaceutical Industrial Units.
Teaching Methodology	Face- to- face
Bibliography	**Greek** • Aulton, M. E., & Taylor, K. Επιμέλεια: Καχριμάνης Κ., Νικολακάκης Ι., Aulton Φαρμακευτική: Σχεδιασμός και Παρασκευή Φαρμάκων, Εκδόσεις Παρισιάνου Α.Ε. (Τελευταία έκδοση) • Αυγουστάκης Κ. (2018). Φαρμακευτική Τεχνολογία-Βιομηχανική Φαρμακευτική, Τόμος Ι, Εκδόσεις Πανεπιστημίου Πατρών • Παπαϊωάννου Γ., Δεμέτζος Κ., Βλάχου-Κωνσταντινίδου Μ. (2009). Φαρμακευτική Τεχνολογία Ι. Εκδόσεις Παρισιάνου Α.Ε. (Τελευταία έκδοση) • Σ. Μαλαματάρης (1995). Τεχνολογία Στερεών Φαρμακευτικών Μορφών. Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης (Τελευταία έκδοση) • Σ. Μαλαματάρης (2004) Τεχνολογία Υγρών και Στείρων Φαρμακευτικών Μορφών Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης (Τελευταία έκδοση) **English** • Aulton, M. E., & Taylor, K. (2013). Aulton's pharmaceutics: The design and manufacture of medicines. Edinburgh: Churchill Livingstone/Elsevier.(4th edition) • Shayne Cox Gad PH.D., D.A.B.T.(2008) Pharmaceutical Manufacturing Handbook Production and Processes. John Wiley & Sons, Inc. (Latest edition) • Allen L.V. Jr., Popovich N. G., Ansel H.C., (2011). Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. Lippincott Williams & Wilkins (9th edition) • Williams R.O III, Watts Alan B., Miller Dave A. (2012). Formulating Poorly Water Soluble Drugs. AAPS Advances in the Pharmaceutical Sciences Series book series, Springer (2nd Edition) • Durivage M.A. (2016). The Certified Pharmaceutical GMP Professional Handbook. Quality Press (2nd Edition) • **Gaisford S., Saunders M. (2013)** Essentials of Pharmaceutical Preformulation. Wiley-Blackwell
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

<table>
<tr><td>Course Title</td><td colspan="5">Pharmacognosy II</td></tr>
<tr><td>Course Code</td><td colspan="5">PHA345</td></tr>
<tr><td>Course Type</td><td colspan="5">Compulsory</td></tr>
<tr><td>Level</td><td colspan="5">Integrated Master</td></tr>
<tr><td>Year / Semester</td><td colspan="5">3rd Year/ 6th Semester</td></tr>
<tr><td>Teacher’s Name</td><td colspan="5">Dr. Constantinos Nikiforou</td></tr>
<tr><td>ECTS</td><td>6</td><td>Lectures / week</td><td>2hrs/ 14 weeks</td><td>Laboratories / week</td><td>3hrs/ 14 weeks</td></tr>
<tr><td>Course Purpose and Objectives</td><td colspan="5">The aim of this course is to enrich the student's knowledge in the subject of Pharmacognosy, providing knowledge of pharmaceutical botany, taxonomy and phytotherapeutics.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">Upon successful completion of the course, students will be able to:
Recognize the most important medicinal plants.
Determine and explain the origin of natural drugs and recognize the most important of them.
Recall the phytochemical classification and know the main categories of active substances of medicinal plants.
Describe the main extraction and identification methods of natural bioactive substances.
Recognize the bioactive compounds present in food.
Determine and explain the quality characteristics of herbs and know the quality control methods for herbal medicinal products.
Summarize the safe use of plants for therapeutic purposes.
Summarize the legislation according to herbal products and be able to have access to available databases of drug organizations.</td></tr>
<tr><td>Prerequisites</td><td colspan="2">PHA240</td><td>Co-requisites</td><td colspan="2">None</td></tr>
<tr><td>Course Content</td><td colspan="5">Theory:
Phytochemical classification. Main categories of phytochemicals.
Natural plant products. Structure, identification, origin and properties:
Carbohydrates, lipids, peptides, glycosides.
Acids, alcohols, esters.
Phenolics, phenolic glycosides.
Terpenes.
Saponins.
Alkaloids.
Bioactive compounds present in food.
Law according to phytotherapeutic products.
Laboratory:</td></tr>
</table>

	• Microscopic examination and identification of medicinal plants. • Macroscopic examination and identification of medicinal plants. • Microscopic and physicochemical properties of starch and fibers (*Solanum tuberosum, Pyrus communis, Allium cepa*). • Separation of pigments from the extract of spinach leaves (*Spinacia oleracea*) by thin-layer chromatography (TLC). • Spectrophotometric determination of lycopene from tomatoes (*Solanum lycopersicum*) and tomato-based food products. • Quantitative assessment of citric acid in fruit juice of *Citrus spp.* and ellagic acid in olive oil. • Isolation of trimyristin from nutmeg seed (*Myristica fragrans*). • Microscopic and physicochemical properties of starch and microscopic characteristics of glandular trichomes in geranium (*Pelargonium zonale*). • Pecting gel production from lemon pericarpium (*Citrus limon*). • Determination of hydrolysable tannins in mature and young leaves of acacia (*Acacia saligna*) and eucalyptus species (*Eucalyptus camaldulensis*). • Isolation of caffeine from black tea leaves (*Camellia sinensis*). • Study of therapeutic properties of numerous pharmaceutical and cosmetic products containing ingredients from natural sources. • Describe and prepare dried samples from organs of important medicinal plants.
Teaching Methodology	Face- to- face
Bibliography	Pharmacognosy, Souleles N. C., 2000, ISBN: 9603170526, Pegasus Publications, Simoni A.-Chahjipantou F. O.E. (the most recent version). Drugs of Natural Origin, Samuelsson G., 2005, Translation in Greek: Kordapatis P., Manesi-Zoupa E., Pairas G., ISBN-10:960-524-015-7, The University Press of Crete (the most recent version). Textbook of Pharmacognosy and Phytochemistry, Avinash Seth Biren Shah, 2009, e book ISBN: 9788131232606, Elsevier India. Fundamentals of Pharmacognosy and Phytotherapy, Heinrich M., Barnes J., Prieto-Garcia J., Gibbons S., Williamson E., 3rd Edition, 2018, ISBN:9780702070082, Elsevier (the most recent version). Drugs of Natural Origin: A Treatise of Pharmacognosy, Sixth Revised Edition, 2010, Samuelson G. and Bohlin L., ISBN: 978-91-976510-5-9, Swedish Pharmaceutical Press (the most recent version).
Assessment	Exams 60% Assignments/Lab 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmaceutical Analysis and Quality Control II				
Course Code	PHA400				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/ 7th Semester				
Teacher's Name	Dr. Ioannis Stavrou/ Dr. Petri Papaphilippou				
ECTS	6	Lectures / week	2hrs/ 14 weeks	Laboratories / week	3hrs/ 14 weeks
Course Purpose and Objectives	The module enables students to: • Study in depth the theory of advanced analytcal methods, in prder to be able to identify and quantify pharmaceutical compounds through various techniques such as mass spectrometry and chromatography (thin layer, paper, open column chromatography, gas chromatography and high-performance liquid chromatography). • Develop a broad array of basic skills and tools of experimental methods of pharmaceutical analysis, carry out laboratory procedures correctly, apply appropriate methods of analysis. This kind of knowledge is considered fundamental and essential for the possible future professional employment of a pharmacy graduate in a Pharmaceutical Analysis Laboratory.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Define and evaluate the quality characteristics of the analytical methods • Describe the instrumentation, principles, quality characteristics and basic applications of certain spectroscopic analytical methods used in pharmaceutical analysis such as Mass Spectrometry (MS) and Nuclear Magnetic Resonance Spectroscopy (NMR). • Describe the instrumentation, principles, quality characteristics and basic applications of the most important chromatographic analytical methods used in pharmaceutical analysis (Liquid Chromatography, Gas Chromatography, Thin Layer Chromatography, Capillary Electrophoresis) • Describe the sample preparation procedures followed before analysis (liquid-liquid, solid-liquid extraction, solid phase extraction) • Understand the principles of pharmacokinetics, pharmacological studies, therapeutic drug monitoring (TDM), protein drug binding, and be able to suggest ways of conducting these studies. • Understand the principles of biomarker analysis. • Interpret the data obtained from spectrometric and chromatographic analyses • Analyze quantitatively and qualitatively different compounds in samples				

	• Provide an understanding of validation data		
Prerequisites	PHA320	Co-requisites	None
Course Content	• **Nuclear Magnetic Resonance Spectroscopy:** Instrumentation. Proton NMR. Applications on structure confirmation of some pharmaceutical compounds. C13-NMR. Applications to Quantitative Analysis. Other specialized NMR Applications • **Mass Spectrometry:** Instrumentation. Mass spectra obtained by electron impact ionization technique. EI mass spectra of several drug molecules. Gas chromatography (GC-MS). Applications of GC-MS. Liquid Chromatography-mass spectrometry (LC-MS). Applications of LC-MS in pharmaceutical analysis. • **Chromatographic theory:** Dead volume and capacity factor. Calculation of column efficiency, origin of peak broadening in HPLC, parameters used to evaluate column performance. Data collection / Processing, Reports. • **Gas Chromatography**: Instrumentation (stationary and mobile phases, detectors). Liquid stationary phase selectivities. GC derivatization. Use of derivatization in GC. Summary of parameters affecting the performance of the capillary. Detectors. GC applications in Quantitative Analysis. Determination of residues, determination of residues. Solid Phase Micro Extraction (SPME) - GC applications in bioanalysis. • **High Performance Liquid Chromatography**: Instrumentation (stationary and mobile phases, detectors). Factors which govern the rate of elution. HPLC applications in quantitative drug analysis in formulations. Assays involving more specialized HPLC techniques. • **Thin Layer Chromatography:** Instrumentation. TLC stationary phases. Eluotropic series and mobile phases. Modification of TLC adsorbant. Detection of compounds on TLC plates. Applications. High Performance TLC (HPTLC) • **High Performance Capillary Electrophoresis:** Instrumentation. Principles of CE separations. Applications of CE in Pharmaceutical Analysis. • **Extraction Methods in Pharmaceutical Analysis:** Common pharmaceutical excipients. Liquid extraction methods. Solid Phase Extraction (SPE). Methodology. Types of adsorbants used in SPE. Recent developments in Solid Phase Extraction. • **Introduction to Biopharmaceutical Analysis:** Bioequivalence assessment, Pharmacokinetics, Protein binding. **Therapeutic Drug Monitoring.** Introduction to Therapeutic Drug Monitoring, Effects of Pre-analytical Variables in TDM, Analytical Techniques used in TDM Monitoring, Examples. Bioanalysis for personalized medicine. Biomarker analysis - Examples. **Laboratory** • Separation of components by liquid - liquid extraction and separation of components in a mixture by solid phase extraction • Separations of mixture of substances and quantitation by HPLC:		

<table>
<tr><td></td><td>

Effect of composition of the mobile phase on the separation by isocratic elution and determination of the optimal gradient elution in the separation of a mixture of substances
Quantitative analysis of an unknown sample (using the internal standard method)
Separation and quantitation of a mixture of substances in pharmaceutical preparations.
Analysis and quantitation by the use of polarimetry
Identification of sugars by specific rotation, [α]
Determination of concentration of an unknown sample
Quantitation by using the fluorescence technique
Uv-Vis Spectrophotometry

</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Pharmaceutical Analysis, A Textbook for Pharmacy Students and Pharmaceutical Chemists, D. G. Watson, RuAngelie Erdada-Ebel, . Elsevier Health Sciences (latest ed.)

Handbook of Pharmaceutical Analysis edited by Lena Ohannesian & Antony J. Streeter Marcel Dekker, Inc.2005

Bioanalytical Chemistry, Andreas Manz, Nicole Pamme and Dimitri Iossifidis, Imperial College Press, May 2004

Understanding Bioanalytical Chemistry: Principles and Applications, Victor A. Gault, Neville H. McClenaghan, Wiley, 2013

Therapeutic Drug Monitoring, Amitava Dasgupta, Academic Press, 2012

Βιοαναλυτική Χημεία, 2015, Γεώργιος Θεοδωρίδης (κύριος συγγραφέας), Στέλλα Γηρούση, Γεώργιος Ζαχαριάδης, Αναστασία-Στέλλα Ζώτου, Βικτωρία Σαμανίδου, ΣΥΝΔΕΣΜΟΣ ΕΛΛΗΝΙΚΩΝ ΑΚΑΔΗΜΑΪΚΩΝ ΒΙΒΛΙΟΘΗΚΩΝ, Εθνικό Μετσόβιο, Πολυτεχνείο, Ηρώων Πολυτεχνείου 9, 15780 Ζωγράφου, www.kallipos.gr

Laboratory Notes prepared by Dr. Ioannis Stavrou</td></tr>
<tr><td>Assessment</td><td>
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<tr><td>Exams</td><td>60%</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Pharmacology II				
Course Code	PHA405				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/ 7th Semester				
Teacher's Name	Dr. Athanasios Metaxas / Dr. Malamati Kourti				
ECTS	6	Lectures / week	2hrs/14 weeks	Laboratories / week	1hr/14 weeks
Course Purpose and Objectives	To provide students with the necessary knowledge about the pathophysiology of diseases, the activities, interactions and adverse effects of different classes of drugs, and the safe administration of medication. The second part of the Pharmacology course continues the presentation of the different therapeutic categories of drugs. Emphasis is placed on drugs of the hematopoietic system, the respiratory system, the gastrointestinal system and drugs against obesity, rectal dysfunction, osteoporosis, inflammation and cancer.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Analyze the principles governing the action of drugs and the mechanisms by which drugs exert their action • Recognize specific therapeutic indications for the administration of drugs • Recall the most common side effects of the different classes of drugs • Describe elements of pharmacokinetics for different classes of drugs • Classify the mechanisms of interaction between drugs and the effects of interactions on drug concentration and/or effectiveness • Explain the importance of therapeutic drug monitoring for dosage adjustment in certain patient populations				
Prerequisites	PHA330	Co-requisites	None		
Course Content	THEORY • Revision of pharmacology I and Introduction to Pharmacology II • Drugs affecting the blood • Drugs for rectal dysfunction • Drugs for osteoporosis • Drugs for obesity • Autacoids and their antagonists • Anti-inflammatory drugs • Drugs affecting the respiratory system				

<table>
<tr><td></td><td>

Drugs affecting the gastrointestinal system and antiemetic drugs
Antineoplastic agents: Pathophysiology of cancer and drugs
New categories of antineoplastic agents

<u>LAB</u>

Case-study based learning
Anticancer drugs: Cell viability assay

</td></tr>
<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>K. Whalen, Lippincott Illustrated Reviews: Pharmacology (latest edition), Wolters Kluwer 2018.

J.M. Ritter, R. Flower, G. Henderson, Y.K. Loke, D. MacEwan, H. Rang, Rang & Dale’s Pharmacology (latest edition), Elsevier 2020.

C. Page, B. Hoffman, M. Curtis, M. Walker, Integrated Pharmacology (latest edition), Elsevier 2006.

R. Seifert, Basic Knowledge of Pharmacology, Springer Nature, 2019.

M.M. Dale, D.G. Haylett, Rang and Dale’s Pharmacology Flashcards Updated Edition, Churchill Livingstone 2014.</td></tr>
<tr><td>Assessment</td><td>
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<tr><td>Exams</td><td>60%</td></tr>
<tr><td>Assignments/Lab</td><td>30%</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
</table>

Course Title	Evidence-Based Medicine and Critical Literature Assessment Skills				
Course Code	PHA420				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/ 7th Semester				
Teacher's Name	Dr. Athanasios Metaxas / Dr. Eleni Moushi				
ECTS	3	Lectures / weeks	2hrs /14 weeks	Laboratories / weeks	None
Course Purpose and Objectives	The provision of clear, evidence-based information about the options and likely outcomes of pharmacotherapy is an essential part of pharmacy practice. This course introduces the concept and principles of evidence-based medicine, and aims to provide students with the necessary knowledge and skills for using scientific evidence in their practice. The overarching goal is for students to understand evidence-based medicine as a life-long, self-directed process, which increases the pharmacist's ability to communicate accurate information and provide high-quality care.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Discuss the nature of evidence-based medicine • Identify and analyze the relative strengths and limitations of different types of evidence • Access information from databases, library sources and the internet • Reference, summarise, appraise and review research literature • Apply the technique of evidence-based medicine to pharmacy practice				
Prerequisites	None	Co-requisites	None		
Course Content	• Evidence-Based Medicine: what it is and why it is important • Essential study design and statistical concepts • Asking well-built questions • Acquiring evidence • Appraising the evidence • Applying (integrating) the evidence • Assessing the approach • Case study-based learning				
Teaching Methodology	Face-to-face				
Bibliography	Bryant PJ and Pace HA: *The Pharmacist's Guide to Evidence-Based Medicine for Clinical Decision Making*, American Society of Health-System Pharmacists (2009)				

<table>
<tr><td></td><td>Hoffmann T, Bennett S, Del Mar CB: Evidence-Based Practice across the Health Professions (3rd edition), ELSEVIER (2017)

Straus SE, Glasziou P, Richardson WS, Haynes RB: Evidence-Based Medicine, How To Practice and Teach EMB (fifth edition), ELSEVIER (2018)

<u>Databases</u>

• UpToDate / <u>Search - UpToDate</u>
• IBM Micromedex® / <u>Home - MICROMEDEX (micromedexsolutions.com)</u></td></tr>
<tr><td>Assessment</td><td><table><tr><td>Exams</td><td>60%</td></tr><tr><td>Assignments/Lab</td><td>30%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Toxicology				
Course Code	PHA425				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/ 7th Semester				
Teacher's Name	Dr. Malamati Kourti				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The course offers a contemporary approach to toxicology including knowledge about the classification, mechanism of action, identification, antidotes and epidemiology of important poisons of chemical, biological and radiological sources. The potential of modern pharmaceuticals and drugs as poisons is also reviewed.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Identify the most important toxic substances and classify them according to their mechanism of toxic action and source • Recognize the major causes of poisoning from toxic substances in different environments as well as the toxic effects of drugs • Describe the mechanism of toxic action of the most important chemical, microbiological and radioactive toxic substances • Explain the distribution of poisons in the body and the sampling methods for analysis and identification of poisoning • Analyze how to deal with the most common poisonings, the available antidotes and how to administer them.				
Prerequisites	PHA330	Co-requisites	PHA405		
Course Content	<u>THEORY</u> • Biochemical and molecular basis of toxicological activity and molecular mechanisms of action of toxic substances. • Biological mechanisms of elimination and excretion of toxic substances. • Toxicokinetics. The role of liver and kidneys. • Toxic manifestations in target organs-systems: Nephrotoxicity, Hepatotoxicity, Neurotoxicity, Cardiotoxicity, Hematotoxicity, Dermatotoxicity. • Chemical carcinogenesis. Mutations. • Embryotoxicity. Teratogens. • Toxic substances: origin, exposure, symptoms of poisoning, mechanism of action, target organs, toxicokinetics, treatment of: ▫ Heavy metals ▫ Medicines				

<table>
<tr><td></td><td>

Organic solvents, aromatic and aliphatic hydrocarbons, environmental pollutants
Pesticides
Radioactivity
Addictive substances, common drugs, alcohol

Antidotes.

<u>CASE-STUDIES</u>

Case studies on clinical symptoms of poisoning, treatments and mechanisms of toxic action of substances.

</td></tr>
<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>Casarett and Doull: Basic Toxicology, Curtis D. Klaassen and John B. Watkins, latest edition, 2015, ISBN: 978-9603949329, Parisianou editions A.E.

Casarett and Doull's Toxicology: The Basic Science of Poisons, Curtis D. Klaassen, 8th edition, 2013, ISBN: 978-0-07-176925-9, McGraw-Hill Education.

Βασική και Κλινική Τοξικολογία, Α.Σ. Τσιφτσόγλου, 1998, ISBN: 960-312-070-7, Εκδόσεις Art of Text A.E.</td></tr>
<tr><td>Assessment</td><td>
<table>
<tr><td>Exams</td><td>60%</td></tr>
<tr><td>Assignments/Lab</td><td>30%</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
</table>

Course Title	Law and Ethics in Pharmacy I				
Course Code	PHA430				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/ 7th Semester				
Teacher's Name	TBA				
ECTS	3	Lectures / weeks	2hrs /14 weeks	Laboratories / weeks	None
Course Purpose and Objectives	The aim of the course is to familiarize students with the legal framework that governs the production, control and circulation of medicinal products in the EU. Also introduced here are the scope of Pharmacy ethics and the Declaration of Helsinki, a statement of ethical principles underpinning biomedical research involving human subjects. The topics covered in this course are required for the licensing exams and registration of Pharmacy graduates in the Cyprus register of Pharmacists.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Identify sources of legislation in the EU • Define the *Acquis Communautaire* of drug-related issues in the EU • Understand key components of the *Drugs for Human Use (Quality, Supply and Price) Law of 2001* • Apply the correct licensing procedure for marketing a pharmaceutical product for human use in the EU countries • Recognize the legal roots and articulate the corresponding responsibilities of the institutions involved in the production, control and circulation of medicinal products for human use in Cyprus • Discuss elements of ethical theory and key moral concepts in healthcare • Relate the core ethical principles that govern informed consent and risk-benefit ratio in medical research • Outline a model for ethical problem-solving and apply it in case-based scenarios				
Prerequisites	None		Co-requisites	None	
Course Content	• EU legislation: Acquis Communautaire; Clinical Studies and Good Clinical Practice; Pharmacovigilance and Risk Management, Good Manufacturing Practice • File documentation: the shared technical document • European Medicines Agency: composition, operation and competences • Pharmaceutical Services: competences, object of competences, composition and operations, committees and boards. • Medicinal products: forms & definitions, circulation requirements, licensing procedures				

	• Good distribution practices (GDP) of medicinal products: a) Introduction-declaration b) Supervision-administration, education c) Stocktaking of merchandise-purchase-storage d) Distribution-delivery of drugs e) Returns f) Withdrawals and g) Archiving • Laws and provisions governing the establishment and operation of a medicinal product factory or laboratory • Legal framework for the advertisement of pharmaceutical products for human use • Introduction to Pharmacy Ethics • The Declaration of Helsinki and the establishment of the Cypriot Bioethics Committee • Case studies in Pharmacy ethics
Teaching Methodology	Face-to-face
Bibliography	Ο περί Φαρμάκων Ανθρώπινης Χρήσης (Έλεγχος Ποιότητας, Προμήθειας και Τιμών) Νόμος του 2001 (Ν. 70(Ι)/2001) Directive 2001/83/EC of the European Parliament on the Community code relating to medicinal products for human use World Medical Association, Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects Wingfield J, Badcott D: Pharmacy Ethics and Decision Making, Pharmaceutical Press (2007) *Additional sources of legislation:* Cypriot legislation: http://www.moh.gov.cy/MOH/phs/; CyLaw - Παγκύπριος Δικηγορικός Σύλλογος - Η Κυπριακή Πηγή Νομικής Πληροφόρησης EU Legislation: http://ec.europa.eu/health/documents/eudralex/ (Eudralex); EU law - EUR-Lex (europa.eu) Cyprus National Bioethics Committee: http://www.bioethics.gov.cy
Assessment	Exams 60% Assignments 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmacology III
Course Code	PHA435
Course Type	Compulsory
Level	Integrated Master
Year / Semester	4th Year/ 8th Semester

<table>
<tr><td>Teacher’s Name</td><td colspan="5">Dr. Athanasios Metaxas</td></tr>
<tr><td>ECTS</td><td>6</td><td>Lectures / weeks</td><td>2hrs /14 weeks</td><td>Laboratories / weeks</td><td>1hr /14 weeks</td></tr>
<tr><td>Course Purpose and Objectives</td><td colspan="5">To provide students with the necessary knowledge about the pathophysiology of diseases, the activities, interactions and adverse effects of different classes of drugs, and the safe administration of medication.
The third part of the Pharmacology course completes the presentation of the different therapeutic categories of drugs. Emphasis is placed on drugs of the Central Nervous System (CNS), the endocrine system, and the mechanisms of drug interactions.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">Upon successful completion of the course, students will be able to:
Analyze the principles governing the action of drugs and the mechanisms by which drugs exert their action
Recognize specific therapeutic indications for the administration of drugs
Recall the most common side effects of the different classes of drugs
Describe elements of pharmacokinetics for different classes of drugs
Classify the mechanisms of interaction between drugs and the effects of interactions on drug concentration and/or effectiveness
Explain the importance of therapeutic drug monitoring for dosage adjustment in certain patient populations</td></tr>
<tr><td>Prerequisites</td><td colspan="2">PHA330</td><td>Co-requisites</td><td colspan="2">None</td></tr>
<tr><td>Course Content</td><td colspan="5"><u>THEORY</u>
Revision of Basic Pharmacological Concepts
Neurodegenerative Diseases & Epilepsy
Antidepressants & Neuroleptics
Anxiolytics & hypnotics, CNS stimulants
General anesthetics & opioid analgesics
Mechanisms of drug interaction
Pituitary & thyroid hormones
Estrogens, androgens, corticosteroids
Insulin & hypoglycemic drugs
Principles of antimicrobial therapy, inhibitors of cell wall synthesis
Protein synthesis inhibitors, folic acid antagonists, quinolones
Antifungal, anti-tuberculosis, anti-viral, antiparasitic drugs
<u>LABORATORY / WORKSHOP</u>
Practical in drug discrimination
Case study-based learning</td></tr>
</table>

Teaching Methodology	Face-to-face
Bibliography	K. Whalen, Lippincott Illustrated Reviews: Pharmacology (latest edition), Wolters Kluwer, 2018. J.M. Ritter, R. Flower, G. Henderson, Y.K. Loke, D. MacEwan, H. Rang, Rang & Dale's Pharmacology (latest edition), Elsevier, 2020. C. Page, B. Hoffman, M. Curtis, M. Walker, Integrated Pharmacology (latest edition), Elsevier, 2006. R. Seifert, Basic Knowledge of Pharmacology, Springer Nature, 2019. M.M. Dale, D.G. Haylett, Rang and Dale's Pharmacology Flashcards Updated Edition, Churchill Livingstone, 2014.
Assessment	Exams 60% Assignments/Lab 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Clinical Pharmacy and Therapeutics				
Course Code	PHA440				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/8th Semester				
Teacher's Name	Marina Markidou				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	To teach students the clinical use of medications emphasizing the application of the principles and methods of pharmacology in clinical practice. The knowledge provided in this course aims to broaden students' knowledge of therapeutics and to facilitate communication between pharmacists and physicians for the purpose of more effective treatment of patients.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Identify the basic principles of pharmacotherapy • Apply the basic principles of pharmacology for the treatment of diseases and emergencies • Describe the pathophysiology of major diseases and the role of pharmacotherapy in their treatment • Recognize the role of the clinical pharmacist in the hospital environment and the importance of communicating with patients, physicians and nursing staff.				
Prerequisites	PHA405		Co-requisites	None	
Course Content	• The role of the clinical pharmacist and the communication with the Physician, nursing staff and patient • The Components of Pharmacotherapy: Pharmaceutical, Pharmacokinetic, Pharmacodynamic, Therapeutic • General principles of Pharmacotherapy • Practical applications of pharmacotherapy analysis • Monitoring of pharmacotherapy • Pharmacogenetics • The principles of prescribing • Pharmacotherapy in young and old people • Pharmacotherapy and reproductive function • Use of Medications in pregnancy and lactation • Pharmacological history and clinical examination and investigation • Pharmacotherapeutic treatment of diseases per organ system (Cardiovascular) • Interactive case study for cardiovascular disease • Pharmacotherapeutic treatment of diseases per organ system (Respiratory)				

	• Respiratory case study and interactive case study • Pharmacotherapeutic treatment of diseases per organ system (Gastrointestinal) • Pharmacotherapeutic treatment of diseases by organ system (Diabetes mellitus and dyslipidaemia) • Interactive case study for diabetes mellitus and dyslipidemia • Medication side effects • Pharmacovigilance • Drug interactions • Pharmaceutical allergies • Acute Poisoning • Pharmaceutical Care and Communication Protocols at the Pharmacy • Patient collaboration • Hospital pharmacy • Drug Development - Clinical Trials • The role of the Pharmacist in conducting clinical trials • Rules of Good Clinical Practice • Labelling and handling of medicines for clinical trials • Clinical cases and clinical cases with drug interactions
Teaching Methodology	Face-to-face
Bibliography	Graham-Smith D.G., Aronson J. K. Κλινική φαρμακολογία και φαρμακοθεραπεία, ISBN 978-960-8041-66-X, Εκδόσεις Τυπωθήτω 2001 C. Whittlesea, K. Hodson. Clinical Pharmacy and Therapeutics, 6th ed. (latest edition), Elsevier 2019 Τσόχας Κ. Α., Κλινική φαρμακολογία, ISBN 960-7461-77-3, Επίτομη νέα έκδοση, Ιατρικές Εκδόσεις Σιώκης 2013 Loscalzo J., Fauci A., Kasper D., Hauser S., Longo D., Jameson L.J., Harrison's Principles of Internal Medicine, 21st ed. (latest edition), ISBN 978-1264268504, McGraw Hill 2022 The British National Formulary (latest edition)
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Law and Ethics in Pharmacy II				
Course Code	PHA445				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/ 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / weeks	3hrs /14 weeks	Laboratories / weeks	None
Course Purpose and Objectives	Part II of the 'Law and Ethics in Pharmacy' course is concerned with the laws and statutes that govern the practice of Pharmacy in the community and clinical settings. Students review the legal framework that determines the standards for their professional registration and conduct, and acquire knowledge on the handling of special classes of drugs. Also discussed here are the codes of ethics for pharmacists and the multiple roles of the Cyprus Pharmaceutical Association in upholding the dignity and integrity of the profession. The topics covered in this course are required for the licensing exams and registration of Pharmacy graduates in the Cyprus register of pharmacists.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Define the legal framework and regulatory provisions governing the Pharmacist's profession in different workplaces • Understand key components of the *Law on Pharmacy and Poisons*, the *Law on Narcotic Drugs and Psychotropic Substances*, and the *Pharmacists (Unions, Discipline and Pension Fund) Law* • Recognize the legal roots and articulate the corresponding responsibilities of the institutions involved in regulating the profession and practice of Pharmacy • Summarize the core ethical values and standards that underlie the profession of Pharmacy • Outline a model for ethical problem-solving and apply it in case-based scenarios				
Prerequisites	PHA430		Co-requisites	None	

<table>
<tr><td>Course Content</td><td>

Pharmacy: Laws and provisions pertaining to the establishment and operation of a pharmacy
Organization of hospital pharmacy: Laws and provisions pertaining to the pharmacies operating compulsorily in hospitals and nursing establishments
Definition and handling of poisons: Tables, prescriptions, preparations
Definition and handling of narcotics: Tables, prescriptions, preparations
Pharmaceutical ethics: Code of ethics and the pharmacist’s role in public health
Disciplinary councils: application of disciplinary penalties for any breach or misdemeanor of the pharmaceutical legislation
Case studies in Pharmacy ethics

</td></tr>
<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>
Ο περί Φαρμακευτικής και Δηλητηρίων Νόμος (ΚΕΦ. 254)

Ο περί Ναρκωτικών Φαρμάκων και Ψυχοτρόπων Ουσιών Νόμος

Ο περί Φαρμακοποιών (Σύλλογοι, Πειθαρχία και Ταμείο Συντάξεων) Νόμος

Directive 2005/36/EC of the European Parliament on the recognition of professional qualifications

Wingfield J, Badcott D: Pharmacy Ethics and Decision Making, Pharmaceutical Press (2007)

Additional sources of legislation:

Cypriot legislation: http://www.moh.gov.cy/MOH/phs/; CyLaw - Παγκύπριος Δικηγορικός Σύλλογος - Η Κυπριακή Πηγή Νομικής Πληροφόρησης

EU Legislation: http://ec.europa.eu/health/documents/eudralex/ (Eudralex); EU law - EUR-Lex (europa.eu)
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<tr><td>Assessment</td><td>
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<tr><td>Exams</td><td>60%</td></tr>
<tr><td>Assignments</td><td>30%</td></tr>
<tr><td>Class Participation and Attendance</td><td>10%</td></tr>
<tr><td></td><td>100%</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Pharmaceutical Care and Communication				
Course Code	PHA450				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	4th Year/ 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The aim of the course is to provide students with basic knowledge about pharmaceutical care and communication with patients. Practical applications of pharmaceutical care in both community pharmacies and healthcare structures such as hospitals are presented. Topics covered include - but are not limited to - issues of patients' expectations from their community pharmacists, patient counseling when dispensing drugs, and monitoring of drug-related problems.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Analyse basic concepts of pharmaceutical care • Prevent and identify or resolve drug-related problems • Assess the patients' health needs and understand their role in pharmaceutical care • Recall the systematic processes that aim to increase patient safety • Recall implementation strategies for the application of pharmaceutical care at the community and hospital level • Evaluate their role as health advisors and public health promoters • Understand the importance of interprofessional communication				
Prerequisites	None		Co-requisites	None	
Course Content	• Definitions of Pharmaceutical Care and Related Concepts • Pharmaceutical Care and the Role of Drug-Related Problems • Pharmaceutical Care and the Role of the Patient • Pharmaceutical Care and Patient Counseling • The Role of Adherence in Pharmaceutical Care • The Role of Interprofessional Communication in Pharmaceutical Care • Medication Review and Medication Reconciliation • Documenting Pharmaceutical Care • Quality Control in Pharmaceutical Care: Guidelines and Protocols • Pharmaceutical Care and Implementation Strategies • Implementation of Pharmaceutical Care in Pharmacy Setting • Implementation of Pharmaceutical Care in Hospitals and Clinics				

	• Pharmaceutical Care and Dispensing Medicines • OTC Medication and Pharmaceutical Care • Pharmaceutical Care, Health Promotion and Disease Prevention • Pharmaceutical care in Europe: costing and services
Teaching Methodology	Face-to-face/ Lectures by Invited Speakers/ Use of virtual patients platform (MyDispense)
Bibliography	The Pharmacist Guide to Implementing Pharmaceutical Care, Filipa Alves da Costa, J. W. Foppe van Mil, Aldo Alvarez-Risco, ISBN 978-3-319-92575-2, Springer 2019. Free download: https://doi.org/10.1007/978-3-319-92576-9 Pharmaceutical care practice: The patient-centered approach to medication management services, R.J. Cipolle, L. Strand, P. Morley, ISBN 978-0-07-175638-9, McGraw Hill Companies 2012 Pharmaceutical Care Made Easy: Essentials of Medicines Management in the Individual Patient, John Sexton, Chris Green, Gareth Nickless, ISBN 978-0853696506, Pharmaceutical Press 2006 The British National Formulary (latest edition)
Assessment	Exams 60% Assignments 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Integrated Master Thesis				
Course Code	PHA500				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester of study	5th Year/ 9th Semester				
Teacher's name	Dr. Eleni Moushi (Coordination)				
ECTS	30	Lectures / week	None	Laboratories / week	None
Course Purpose and Objectives	This course aims to provide students with all the necessary tools needed to design, organize and implement a scientific study as well as to adequately analyze, document, and present its content. The ultimate goal of the course is to complete a scientific paper as well as to support it through an oral presentation under the guidance and supervision of a two-member advisory committee as well as by the person responsible for the course.				
Learning Outcomes	Upon successful completion of the course students should be able to: • List in a logical sequence the steps required to organize and implement a literature review and research project. • Identify and recognize scientific sources relevant to the subject under negotiation by searching printed and electronic scientific databases and critically approach the extracted scientific information. • Describe and explain the structure of scientific articles, clearly summarize their content and compile it into a single text. • Evaluate and discuss issues related to research bioethics and ethics. • Design, organize, compile, and implement a descriptive type of bibliographic review and / or experimental study of health sciences subjects in accordance with international standards and using validated bibliographic systems. • Clearly present the problem, purpose, methodology and results obtained from the analysis of the data of an experimental study as well as document the findings and contrast them critically with findings of other studies. • Organize and complete the presentation of a scientific work through a printed textbook as well as an oral presentation to the general public.				
Prerequisites	See Prerequisite courses specified in the relevant Thesis Guide		Co-requisites	None	
Course Content	The course includes supervision, mentoring and coordination meetings, writing a research proposal, writing and presenting the thesis.				

<table>
<tr><td></td><td>Coordination Meetings: The student participates in pre-defined meetings with the coordinator of the thesis where specific topics are presented and analyzed, which are mainly related to the documentation of scientific information and to the ability to summarize and present the content of the work according to the conditions set by the Thesis Guide.
Supervision and guidance: On a regular weekly basis, meetings are held between the student and the supervisor to provide guidance, organize work progress and receive feedback on the progress of the project.
Preparation of the research proposal: The students, with the guidance of their supervisor, are preparing a research proposal on the subject that they have undertaken and will be negotiating.
Research project presentation: Upon completion of the scientific research, the student writes his / her work according to the instructions provided in the Thesis Guide. Upon acceptance of the final text by the two-member committee, the student receives the date of presentation of his / her work in front of the two-member committee. Upon acceptance of the project and evaluation by the Selection Board, the student submits the final written project to the Secretary of the Department in order to receive the final grade of the course.
A detailed description of the course content and conditions is provided in the Thesis Guide</td></tr>
<tr><td>Teaching Methodology</td><td>Face to face & Individual meetings with supervisors and other board members (See Thesis Guide)</td></tr>
<tr><td>Bibliography</td><td>Panagiotakos D (2010), Research Methodology and Data Analysis for the Health Sciences, Athens, BC Publications. Kostaki.
Higgins JPT, Green S. (2011) Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. The Cochrane Collaboration
Marder P. Michael, (2011) Research Methods for Science. Cambridge University</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Written research proposal and project</td><td>20%</td></tr><tr><td>Written research project</td><td>60%</td></tr><tr><td>Project Presentation</td><td>20%</td></tr></table>It is noted that success in the course requires securing the basis for each of the individual assessments.</td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
</table>

Course Title	Practical Training				
Course Code	PHA530				
Course Type	Compulsory				
Level	Integrated Master				
Year / Semester	5th Year/ 10th Semester				
Teacher's Name	TBA				
ECTS	30	Lectures / week	Six months of Practical Training	Laboratories / week	None
Course Purpose and Objectives	The practical training aims to provide students with the experience and skills required for practicing as a pharmacist. It is a prerequisite for their licensure exams and their registration in the Cyprus Register of Pharmacists.				
Learning Outcomes	Upon successful completion of a compulsory six-month practical training period at a community or hospital pharmacy that is open to the public, students will be able to: • Identify and describe the basic activities and mode of operation of the workplace where the practical training took place • Combine theoretical knowledge with activities in the workplace, and apply them to the tasks assigned to them by the supervising pharmacist • Describe the way in which medicinal products are managed and supplied according to the approved supply procedure • Identify the form and content of a medical prescription • Verify the validity and authenticity of a medical prescription • Execute a medical prescription under the supervision of the competent pharmacist • Prepare simple galenicals based on relevant instructions				
Prerequisites	All courses up to the fourth year	Co-requisites	None		
Course Content	The duration of the practical training period for the professional qualification of Pharmacists is specified in DIRECTIVE 2005/36/EC of the European Parliament and the Council of the European Union and has been set to at least six months. The traineeship may take place in a pharmacy that is open to the public or in a hospital pharmacy, under the supervision of that hospital's pharmaceutical department. The content and structure of the practical training period is detailed in the EUC practical training guide. Tasks related to the practice of Pharmacy are determined by the preceptor Pharmacist, who has to be a licensed professional with at least three years of experience in the appropriate community or hospital pharmacy setting. Additional assignments are allocated to the students by a dedicated Academic supervisor, who provides personal instruction and mentorship to the students during their				

<table>
<tr><td></td><td>training period, and further monitors the implementation of tasks that are relevant to the practice of Pharmacy. The students' prior working experience in a Pharmacy is taken into account when determining the training tasks. These tasks can range from dispensing medicines and ordering/returning medicinal products, to evaluating drug-drug interactions or the legal aspects of Pharmacy organisation.

It is absolutely necessary that the practical training areas within the Republic of Cyprus be approved by the Pharmacy Board following a written application by the interested parties.

The Pharmacy Board must be notified prior to the commencement of the practical training or of part thereof. Any practical training of which the Pharmacy Board has not been notified will not factor into the calculation of the required practical training. Any practical training that is shorter than one month will not be taken into consideration.

The practical training or part thereof can take place outside Cyprus on the condition that such training takes place on a site approved by the competent authorities of the country in question for practical training of its own graduates and that the certificate for such training is signed by the competent authorities of the country in question.</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>None</td></tr>
<tr><td>Assessment</td><td>Exams 0%
Assignments/Lab 0%
Participation in Practice Training 100%
100%</td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
</table>

Course Title	Pharmaceutical Marketing and Management				
Course Code	PHA260				
Course Type	Pharmaceutical Elective				
Level	Integrated Master				
Year / Semester	2nd Year/ 4th Semester or 3rd Year/ 5th Semester or 4th Year/ 7th Semester or 4th Year/ 8th Semester				
Teacher's Name	Dr. Myria Ioannou				
ECTS	6	Lectures / week	3hrs/14 weeks	Laboratories / week	None
Course Purpose and Objectives	Proper management of a medicinal product requires not only product and market knowledge, but also knowledge of the administration and management of pharmaceutical industries. This course aims to provide students with information about the principles of administration and business strategies of pharmaceutical industries and the basic theories of pharmaceutical marketing. Students will also be able to identify the characteristics of a successful medicinal product and analyze the complex pricing process of a new drug. Moreover, students will gain practical experience through the analysis of case studies on the management, planning, control, design and promotion of pharmaceutical products and industries.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Explain the need and the process of effective strategic planning • Develop key management skills/ abilities • Analyze the basic principles and theories of pharmaceutical marketing • Analyze the key features of a successful medicinal product • Identify the factors that determine the pricing of pharmaceuticals • Organize the marketing strategy of a medicinal product				
Prerequisites	None	Co-requisites	None		
Course Content	• The concept of modern business and pharmaceutical industry in particular • Day-to-day application of management strategies in the pharmaceutical field • Business/ Management Strategies in Medicinal products: Decision Making, Planning and Budgets, Human Resources Organization, Management and Audit. • Basic Marketing Principles				

	• Selection of the most important medicinal product characteristics and profiling • Methods of segmentation and targeting in the drug market • Distribution systems for pharmaceutical products • Medicinal product pricing methods • Distribution of pharmaceutical products • Market share, Degree of penetration and possession of a drug • Drug prescriptions - What factors can affect them • Life cycle of pharmaceuticals (prototypes and generic) • Strategy and methods of communication and promotion of medicinal products
Teaching Methodology	Face- to- face
Bibliography	Φαρμακοενημερωτική: Ο Αποτελεσματικότερος Συντελεστής στο Φαρμακευτικό Marketing, 2η έκδοση, 2014, Ησαΐας Σ., ISBN: 9789963716838 Marketing στο Νοσοκομείο, Αναστάσιος Μουμτζόγλου. ISBN: 960-255-189-5 Marketing στις υπηρεσίες υγείας, 1η έκδοση, 2011, Παύλος Αντ. Σαράφης ISBN: 978-960-452-132-6 G., Jones, J., George, Contemporary Management, 9th Edition McGraw Hill, 2018.
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Health Economics				
Course Code	PHA265				
Course Type	Pharmaceutical Elective				
Level	Integrated Master				
Year / Semester	2nd Year/ 4th Semester or 3rd Year/ 5th Semester or 4th Year/ 7th Semester or 4th Year/ 8th Semester				
Teacher's Name	Mrs. Iris Nikolaidou Rousou				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The course aims to assist in rational decision-making based on the limited resources available in the healthcare sector. It will analyze the demand for health services and the factors that affect the demand for health care. It will analyze and compare the supply and costs of health services. It will explain the theory of productivity and the healthcare markets. It will analyze the role of the state and the insurance companies, equality in health, financing and resource allocation. It will also help in understanding Marketing theories and their application in health, redesigning business processes and participating in the development and empowerment of health services.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Analyze the objective and the role of economics in health and health care sector, • Record and explain economic theories on health and health care and make decisions taking into consideration the limited resources provided in the healthcare sector; • Explain demand in health services, effecting factors, demand for health care, and correlate supply to the cost of health services and analyze and apply the theory of productivity; • Describe and explain the markets in the health sector, the role of the state and insurance companies and correlate the finacing methods of health services; • Argue in favor of and explain the necessity of equality and the resources allocation in the health sector; • Analyze and assess financial cost when making decisions for the implementation of health policies, while preserving and promoting Quality in Health Services; • Participate in the redesign of business processes; • Recognize and apply marketing techniques in the Health sector, Empowerment of Health Services.				
Prerequisites	None	Co-requisites	None		
Course Content	The following sections will be developed as part of the course:				

<table>
<tr><td></td><td>Introduction and content of health economics, analysis of the basic economic problem, the problem of choice and opportunity cost, incomplete market and healthcare system costs, principles and objectives of healthcare systems “Health Care” as a commodity and public intervention, characteristics of the “Health Care” commodity, types of public intervention. Induced demand in health services, the physician as an advocate of the patient, financing of healthcare services, the role of the state and of insurance companies in healthcare systems, equality in health, hospitals as financial units: inputs – outputs – costs – quality, economic goals of hospital function, compensation methods for suppliers – compensation of the medical body, compensation of hospital services providers: fixed – flexible – variable hospital costs – fee for service – global budgeting – Diagnosis Related Groups (DRGs), management of resources and organizational development. Quality of healthcare services, issues of human resources development, enhancement of healthcare services and finally, marketing of health services.</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Υφαντόπουλος, Ι.Ν., (2018), Τα Οικονομικά της Υγείας: Θεωρία και Πολιτική, Αθήνα: Τυπωθήτω - Γιώργος Δάρδανος, ISBN 978-960-402-093-5.

Santerre, R. Neun, S., (Ed. Vozikis & Spyropoulou), (2015), Οικονομικά της Υγείας: Θεωρία Προοπτική και Συστηματική Μελέτη, Αθήνα: Πασχαλίδης, ISBN 978-960-489-181-8

Χλέτσος, Μ., (2011), Οικονομικά της Υγείας. Αθήνα: Πατάκης, ISBN 978-960-164-240-6.

Bella, M., (2019), The Economics of Health and Health Care, United States of America: Hayle Medical, ISBN13 9781632416261

Sherman, F., Allen C., G., Miron S., (2017), The Economics of Health and Health Care, London; New York: Routledge, ISBN 978-1-138-20805-6.

Mark P., Thomas M., Pedro B., (2012), Handbook of Health Economics, Volume 2,1st Edition, Amsterdam; Boston : Elsevier/North Holland, ISBN: 978-044-453-592-4</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Exams</td><td>70%</td></tr><tr><td>Assignments</td><td>20%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
<tr><td>Course Title</td><td>Pharmaceutical Regulatory Affairs</td></tr>
</table>

Course Code	PHA270				
Course Type	Pharmaceutical Elective				
Level	Integrated Master				
Year / Semester	4th Year/ 7th Semester or 4th Year/ 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3hrs/14 weeks	Laboratories / week	None
Course Purpose and Objectives	The aim of the course is to teach the students the fundamentals of regulatory affairs, familiarize them with industry practices, and present some practical applications in order to develop the analytical interpretive skills required for a regulatory-affairs professional.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Recall the regulatory procedures for medical products and how to maintain regulatory compliance with EU regulations. • Describe product development processes through commercialization, product characterization and pre-clinical evaluation, pharmaceutical industry requirements, clinical trial requirements, good manufacturing practices (GMPs), good laboratory practices (GLPs) and inspections. • Define the various types of Marketing Authorisation Applications (MAA) for submission. • Evaluate regulatory processes in terms of efficiency and effectiveness • Recall the different modules in the Common Technical Document (CTD) for a submission dossier • Describe the requirements of packaging and labelling for pharmaceutical products in the EU.				
Prerequisites	PHA330	Co-requisites	None		
Course Content	• **Introduction to Regulatory Affairs and Compliance** • **EU regulatory framework** • **EMA, ICH and Ph.Eur** • **Regulatory affairs during product development (non-clinical and clinical studies)** • **MAA – Regulatory submission procedures:** o Centralised, Decentralised procedure, o Mutual Recognition procedure, o Special cases (Orphan drugs, paediatric medicines, advanced therapies, herbal medicinal products), o Scientific advice (SA) • **Labelling and packaging:** guidelines and directives for labelling and patient information leaflets (PILs), SmPC requirements, labelling requirements, Patient Information Leaflets (PILs) in Europe, Readability guidelines. • **The registration dossier:** overview of the Common Technical Document (CTD), GxP and the marketing authorisation dossier				

<table>
<tr><td></td><td>• Post approval regulatory activities: filing variations (Type IA, IB and II), renewals and pharmacovigilance</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>Medical Regulatory Affairs. An International Handbook for Medical Devices and Healthcare Products (3rd ed.), Jack Wong, Raymond K. Y. Tong, Stanford Publishing, 2022

Medical Product Regulatory Affairs: Pharmaceuticals, Diagnostics, Medical Devices, J. Tobin, G. Walsh, Wiley Blackwell, 2008

Fundamentals of EU Regulatory Affairs, Ninth Edition, RAPS © 2020.

Fundamentals of International Regulatory Affairs, Fifth Edition, RAPS © 2021

Fundamentals of US Regulatory Affairs, 11th Edition. RAPS © 2019</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Exams</td><td>60%</td></tr><tr><td>Assignments/Lab</td><td>30%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>Greek and English</td></tr>
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Course Title	Cosmetology-Cosmetics Technology				
Course Code	PHA275				
Course Type	Pharmaceutical Elective				
Level	Integrated Master				
Year / Semester	4th Year/ 7th Semester or 4th Year/ 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3hrs/ 14 weeks	Laboratories / week	None
Course Purpose and Objectives	The aim of this course is for students to understand theoretically and practically the formulation and mode of action of cosmetic preparations and to apply this expertise either in the community pharmacy or in the industry. The student acquires the ability to identify the ingredients required for each form of cosmetic and is familiar with the whole process of developing a new cosmetic product. Finally, learns all the necessary quality controls necessary for every type of cosmetic product.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Describe the ingredients used for the preparation of a cosmetic products and their properties • Identify the functionality of each ingredient in a given recipe for a cosmetic product • Select the appropriate ingredients and preparation method for the formulation of a cosmetic product • Determine the effectiveness of a product • Describe and explain the technology of cosmetic products • Overview the issues related to cosmetic product safety assessment • Explain the EU legislation on cosmetic manufacturing and market placement				
Prerequisites	PHA340	Co-requisites	None		
Course Content	• Skin anatomy and physiology • Ingredients for cosmetic preparations (surfactants, moisturizers, preservatives, antioxidants, pigments, odor enhancers, etc.) • Cosmetic preparations for the skin (anatomy and physiology of the skin, creams, face masks, powders, sunscreen, antiperspirants). • Cosmetics for eyes and lips (eye make-up, eye shadows, lipsticks).				

	• Cosmetic preparations for the oral cavity (toothpaste, mouthwash). • Cosmetic nail preparations (varnishes, colorants, hardeners). • Hair cosmetics (hair anatomy elements, shampoos, hair dyes, hair styling, hair care). • EU legislation on cosmetic products
Teaching Methodology	Face- to- face
Bibliography	• Κοσμητολογία, Γ. Θ. Παπαϊωάννου, Έκδοση: 4/2006 ISBN: 9780003406009 • Καλλυντικά - Συστατικά και Εφαρμογές, Κ. Μουλοπούλου-Καρακίτσου, Δ. Ρηγόπουλος, Ι.Δ. Στρατηγός Έκδοση: 1/2001 ISBN: 960-7308-87-5 • Formulas, Ingredients and Production of Cosmetics, H. Iwata, K. Shimada, Springer, 2013, ISBN: 9784431540618 • Cosmeceuticals and Cosmetic Ingredients, L. S. Baumann, 2014, ISBN-13: 978-0071793988
Assessment	Exams 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Principles of Nuclear Pharmacy / Radiopharmaceuticals				
Course Code	PHA280				
Course Type	Pharmaceutical Elective				
Level	Integrated Master				
Year / Semester	2nd Year/ 4th Semester or 3rd Year/ 5th Semester or 4th Year/ 7th Semester or 4th Year/ 8th Semester				
Teacher's Name	Dr. Athanasios Metaxas				
ECTS	6	Lectures / weeks	3hrs/ 14 weeks	Laboratories / weeks	None
Course Purpose and Objectives	Nuclear pharmacy is a specialty area of pharmacy practice involved with the production and dispensing of radioactive materials for diagnostic and therapeutic use in nuclear medicine. The course aims to stimulate students' interest for further study in this specialized practice, by providing an introductory overview of the concepts of nuclear pharmacy. The course covers basic and clinical aspects of radiopharmacy, introducing students to the fields of radiation emission and detection, radiopharmaceutical chemistry and quality control, regulatory and safety issues, and the applications of nuclear pharmacy.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Summarize the properties of an ideal radiopharmaceutical • Describe key steps in the production, detection and quality control of radionuclides and radiopharmaceuticals • Recognize the basic equipment in a nuclear pharmacy • Discuss the regulatory requirements of radiopharmacy, with emphasis on the regulations of radiation protection • Perform dosimetry calculations and calculate doses of radiopharmaceuticals following radioactive decay • Recognize major applications of radiopharmaceuticals in clinical practice				
Prerequisites	None		Co-requisites	None	
Course Content	• Structure of the atom and the nature of radioactive decay • Instruments for radiation detection and measurement • Production of radionuclides • Production of radiopharmaceuticals • Quality control of radiopharmaceuticals • Nuclear Pharmacy • Radiation dosimetry • Regulation and medical uses of radiation • Principles of radiation protection				

<table>
<tr><td></td><td>

Non-imaging tests (in vitro and in vivo)
Diagnostic uses of radiopharmaceuticals in nuclear medicine
Therapeutic uses of & adverse reactions to radiopharmaceuticals

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<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>Saha GB: Fundamentals of Nuclear Pharmacy (Seventh Edition), Springer (2018)

Kilbourn MR, Scott PJH (editors): Handbook of Radiopharmaceuticals, Methodology and Applications (Second Edition), WILEY (2021)

Mettler FA Jr., Guiberteau MJ: Essentials of Nuclear Medicine and Molecular Imaging (7th Edition), ELSEVIER (2018)</td></tr>
<tr><td>Assessment</td><td>
<table>
<tr><td>Exams</td><td>70%</td></tr>
<tr><td>Assignments</td><td>20%</td></tr>
<tr><td>Class Participation and Attendance</td><td>10%</td></tr>
<tr><td></td><td>100%</td></tr>
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<tr><td>Language</td><td>Greek and English</td></tr>
</table>

Course Title	Nutrition and disease				
Course Code	PHA285				
Course Type	Pharmaceutical Elective				
Level	Integrated Master				
Year / Semester	2nd Year/ 4th Semester or 3rd Year/ 5th Semester or 4th Year/ 7th Semester or 4th Year/ 8th Semester				
Teacher's Name	Dr. Stavrie Chrysostomou				
ECTS	6	Lectures / weeks	3hrs /14 weeks	Laboratories / weeks	None
Course Purpose and Objectives	The aim of the course is to familiarize students with the terminology of Nutrition Science and Clinical Dietetics. The first part of the course introduces the meaning of essential nutrients, their biological roles and the related metabolic pathways by which they perform important biological functions. The second part covers subjects on the importance of nutrition in the prevention and treatment of various disorders and common diseases.				
Learning Outcomes	Upon successful completion of the course, students should be able to: • Describe the roles of essential nutrients in health • Recognize symptoms of nutritional deficiency, toxicity and people at nutritional risk • Interpret the results of a simple nutritional assessment • Describe the basic dietary recommendations for the prevention of non-communicable diseases • Choose the appropriate nutritional supplements depending on the patient's health status • Identify the nutritional needs of patients, based on their knowledge of the pathophysiology of the different diseases				
Prerequisites	None	Co-requisites	None		
Course Content	• Basic principles of Nutrition Science. • Macronutrients (proteins, fats, carbohydrates). Biological role, processes of digestion, absorption and metabolism, general dietary recommendations, signs of deficiency and toxicity. • Minerals, Vitamins and Trace Elements. Biological role, processes of digestion, absorption and metabolism, general dietary recommendations, signs of deficiency and toxicity. • Basic principles of nutritional assessment. Calculation of basal metabolism, basic indicators of nutritional status. • Nutritional supplements and special diets (gluten free diets, low FOD-MAP diet, ketogenic diet). • Nutritional management of digestive disorders (gastritis, gastroenteritis, peptic ulcer, diarrhea, constipation). • Obesity. Prevention and management through dietary recommendations.				

	• Nutritional anemias (iron deficiency and megaloblastic anemia). Prevention and management through dietary recommendations. • Diabetes. Prevention and management through dietary recommendations. Gestational diabetes. • Hypertension, dyslipidemia and other cardiovascular diseases. Prevention and management through dietary recommendations. • Nutritional management of disorders of the lower digestive system (disorders of pancreas, liver, gallbladder).
Teaching Methodology	Face-to-face
Bibliography	• Ζαμπέλας, Α. Κλινική Διαιτολογία και Διατροφή με στοιχεία Παθολογίας. Ιατρικές Εκδόσεις Πασχαλίδης, Αθήνα. ISBN: 960-489-293-2. (2008) • Εγχειρίδιο Διατροφής. Ιατρικές εκδόσεις Π.Χ. Πασχαλίδης. Γενική επιμέλεια: Αθανάσιος Παπαβασιλείου. (2008) • Κατσιλάμπρος, Ν., Γιαννίκου, Ε., Μακρυλάκης, Κ., Ιωαννίδης, Ι. Κλινική Διατροφή. Εκδόσεις ΒΗΤΑ, Αθήνα. ISBN: 978-960-452-075-6. (2010) • Γιάννης Μανιός, Διατροφική Αξιολόγηση, Εκδόσεις Πασχαλίδη. ISBN: 978-960-399-468-8. (2006) • Thomas, B., Bishop, J. Manual of Dietetic Practice. Wiley, Singapore (latest Ed). ISBN: 978-1405135252. (2013) • Mahan, K., Escott-Stump, S. Krause's Food and Nutrition Therapy. W. B. Saunders/Elsevier (latest Ed). ISBN: 978-1437722338. (2008) • Nieman DC. Nutritional Assessment (7th Ed). Boston, McGraw-Hill Education (2019)
Assessment	Exams 60% Assignments 30% Class Participation and Attendance 10% 100%
Language	Greek and English

Course Title	Pharmacoepidemiology and Pharmacovigilance				
Course Code	PHA290				
Course Type	Pharmaceutical Elective				
Level	Integrated Master				
Year / Semester	2nd Year/ 4th Semester or 3rd Year/ 5th Semester or 4th Year/ 7th Semester or 4th Year/ 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / weeks	3hrs /14 weeks	Laboratories / weeks	None
Course Purpose and Objectives	Pharmacoepidemiology combines the research methods of epidemiology to the study of pharmacology, aiming to estimate the probability of drug-induced beneficial and adverse effects in a population. Pharmacovigilance is the science and activities relating to the detection, assessment, understanding and prevention of adverse effects or any other drug-related problem. Pharmacoepidemiology and Pharmacovigilance complement each other, working in synergy to allow for a better assessment and management of adverse drug reactions. This course provides an overview of the epidemiological tools that can be used in Pharmacoepidemiology and Pharmacovigilance, along with the strengths, weaknesses, and specificities associated with each tool. It aims to equip students with a basic understanding of the concepts and practice of Pharmacoepidemiology and Pharmacovigilance.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Explain how new medicines are assessed for their efficacy and safety before being recommended for use • Discuss issues surrounding the risks and benefits of drug use in humans, the way adverse drug effects (ADEs) are detected and monitored, and the associated legal frameworks • Distinguish and compare important statistical methods and epidemiological concepts of drug safety research • Reflect critically upon these methods and how they can be applied to specific drug issues • Explain confounding and other biases • Have an overview of the role of databases in Pharmacoepidemiology and Pharmacovigilance				
Prerequisites	None		Co-requisites	None	

<table>
<tr><td>Course Content</td><td>Introduction to Pharmacoepidemiology and Pharmacovigilance: definitions, objectives, importance & historical perspectives
The concept of safety
Pharmacoepidemiology and Pharmacovigilance through the product life cycle
Essential statistics for epidemiology
Tools for active and passive Pharmacovigilance
Pharmacoepidemiologic tools and study designs
Bias and confounding factors
Choosing the appropriate design in Pharmacoepidemiology
Databases in Pharmacoepidemiology and Pharmacovigilance
Challenges and limitations in Pharmacoepidemiology and Pharmacovigilance
Beyond drug safety: special applications of Pharmacoepidemiology</td></tr>
<tr><td>Teaching Methodology</td><td>Face-to-face</td></tr>
<tr><td>Bibliography</td><td>Nour S, Plourde G: Pharmacoepidemiology and Pharmacovigilance, Synergistic Tools to Better Investigate Drug Safety, ELSEVIER (2018)

Strom BL, Kimmel SE, Hennessy S (editors): Textbook of Pharmacoepidemiology (Third Edition), WILEY Blackwell (2021)

Waller P, Harrison-Woolrych M: An introduction to Pharmacovigilance (Second Edition), WILEY Blackwell (2017)

Edwards IR, Lindquist M (editors): Pharmacovigilance, Critique and Ways Forward, Adis (2017)</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Exams</td><td>70%</td></tr><tr><td>Assignments</td><td>20%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
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