ARISTOTLE UNIVERSITY OF THESSALONIKI

SCHOOL OF PHARMACY

BULLETIN OF STUDIES

SCHOOL OF PHARMACY

ARISTOTLE UNIVERSITY OF THESSALONIKI

ACADEMIC YEAR 2012–2013

THESSALONIKI 2012

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THE ARISTOTLE UNIVERSITY OF THESSALONIKI AND THE SCHOOL OF PHARMACY

The Aristotle University of Thessaloniki was founded in 1925 on the initiative of Alexandros Papanastasiou and begun to operate with five faculties: Theology, Philosophy, Law and Economics, Physics and Mathematics, and Medicine. The Schools of Physics, Mathematics, Chemistry, Physiognosy (Biology - Geology) and, in 1955, the School of Pharmacy, were gradually added to the Faculty of Physics and Mathematics.

Initially, the newly established School of Pharmacy enrolled twenty students per year and the teaching staff was ten full professors and four assistant professors. The majority of the faculty members belonged to the Faculty of Physics and Mathematics (6) and the Faculty of Medicine (5). As it is obvious, the School of Pharmacy of Thessaloniki started its life somewhere between the Faculty of Physics and Mathematics and the Faculty of Medicine, a place that it has kept until the present day.

The School of Pharmacy was initially comprised of two Academic Chairs: a) the Chair of Pharmaceutical Chemistry with elements of Pharmacognosy, and b) the Chair of Pharmacotechniques and Pharmaceutical Technology, and by two Laboratories: a) the Laboratory of Pharmaceutical Chemistry with elements of Pharmacognosy and b) the Laboratory of Pharmacotechniques and of Control of Medicines. The pharmaceutical courses were initially taught by the late Konstantinos Makris, who taught Pharmacognosy, Pharmaceutical Chemistry and Pharmacotechniques. Around 1970, following Prof. Makris' retirement in 1968, the pharmaceutical courses were assumed by the late Professors Georgios Fokas (Pharmacognosy and Pharmaceutical Chemistry) and Nikolaos Ekonomou-Petrovitch (Pharmaceutical Technology - Prescription formulation techniques). Very soon, new courses were added and Pharmaceutical Chemistry was separated from Pharmacognosy. In 1985, the Department of Pharmacognosy-Pharmacology was created and in 1987 two new laboratories, those of Pharmacognostics and of Pharmacology were added.

Since its foundation and until 1989, the School of Pharmacy was housed on the 3rd floor of the Chemistry Building. In 1989 the School was transferred to its new facilities in the newly built Building of Pharmacy & Biology, where it is located until the present day.

Currently, the School of Pharmacy enrolls 110 to 150 students per year. Its faculty consists of five full professors, ten associate professors, five assistant professors and seven lecturers. Faculty members from the Schools of Chemistry, Medicine, Veterinary Medicine, Mathematics, Physics and Biology teach the non-pharmaceutical courses.

Since the 2001-2002 academic year a Graduate Studies Program has been launched and operates in the School of Pharmacy, conferring both a Master's Degree in the Pharmaceutical Sciences and a Doctorate in Pharmacy.

STRUCTURE AND OPERATION OF THE SCHOOL OF PHARMACY

The School of Pharmacy is comprised of the following Departments:

1. Department of Pharmaceutical Chemistry with its "Laboratory of Pharmaceutical Chemistry".
2. Department of Pharmaceutical Technology with its Laboratories of i) Pharmacotechniques and Control of Medicines and ii) Pharmaceutical Analysis.
3. Department of Pharmacognosy - Pharmacology with its Laboratories of i) Pharmacognosy and ii) Pharmacology.

The administrative bodies of the School of Pharmacy are the General Assembly (GA), the Board of Administration and the Chairman. The supreme administrative body is the General Assembly.

The General Assembly is composed of all the members of the Faculty, the delegates of the Student Body (50% on the number of faculty members), the delegates of the Regular Laboratory Instructors (RLI, 5% on the number of faculty members), and the delegates of the Regular Laboratory Technicians (RLT, 5% on the number of faculty members). The General Assembly is chaired by the Chairman of the School, who is elected (along with the Vice Chairman) for a two-year tenure by all the faculty members of the School, and by delegates of the undergraduate and graduate students, of the RLI's and of the RLT's.

The Board of Administration of the School consists of the Chairman, the Vice Chairman, the Heads of the Departments, and two delegates of the undergraduate students. A delegate of the graduate students, of the RLI, and of the RLT can be also part of a Board meeting, with the right to vote on matters concerning their own groups.

ELECTED ADMINISTRATIVE BODY	
Chairman:	Kokkalou Evgenios
Vice Chairman:	Panagiotidis Christos
Heads of the Departments:	
1) Pharmaceutical Chemistry	Geronikaki Athina
2) Pharmaceutical Technology	Malamataris Stavros
3) Pharmacognosy - Pharmacology	Niopas Ioannis

COMPOSITION OF THE GENERAL ASSEMBLY	
FULL PROFESSORS:	Geronikaki Athina
	Demopoulos Vassilios
	Kanellis Aggelos
	Kokkalou Evgenios
	Koundourellis Ioannis
	Malalamataris Stavros
	Niopas Ioannis
	Panagiotidis Christos
	Rekka Eleni
	Sklaviadis Theodoros
	Tsiftsoglou Asterios
	Hadjipavlou-Litina Dimitra
ASSOCIATE PROFESSORS:	Katsiotis Stavros
	Papadopoulou Lefkothea

	Vizirianakis Ioannis
ASSISTANT PROFESSORS:	Kachrimanis Kyriakos
	Lazari Diamanto
	Markopoulou Catherine Nikolakakis Ioannis
	Papagianopoulou Dionysia
	Fatouros Dimitrios
LECTURERS:	Nikolaou Ioannis
	Panagopoulou-Kaplani Athanasia

REGULAR LABORATORY TECHNICIANS (RLT's):

RLI DELEGATES:	Gavrieli Chrysi
RLT DELEGATES:	Gavalas Antonios
STUDENT DELEGATES:	13 Undergraduates, 4 Graduates

THE SCHOOL'S SECRETARIAT

Simeonidou Konstandia, Acting Secretary

Mitrokanelos Konstantinos, Clerk

Serbezoudis Dimitrios, Clerk

Petkaris Giorgos, Clerk

Viarou Chrysanthi, Librarian

THE SCIENTIFIC & ACADEMIC DISCIPLINES OF THE DEPARTMENTS AND THE DEPARTMENTAL STAFF

a) Scientific Disciplines

The cognitive subjects of the three Departments of the School of Pharmacy, as defined by the Decision of the General Assembly and by the ministerial decree no. B1/676/24-12-86; and as published in the Government's Gazette no.27/1987 (issue no B1), are the following:

1. Department of Pharmaceutical Chemistry

The chemical and pharmacochemical study of substances of pharmaceutical and of broader biological interest

The chemical and pharmacochemical study of chemical compounds (organic, inorganic, metallo-organic) of broader pharmaceutical-biological interest includes: Design, composition (isolation), separation-obtaining, properties, control (identification, purity, content) and structure of the compounds.

The chemical and pharmacochemical study (action, chance, interaction) of the biologically drastic agents.

The relation between molecular structure/action of biologically active agents. The quantitative relations of all the above, that is: structure, properties and behavior from a theoretical viewpoint.

The study of chemical principles and methods that subserve the development of pharmacochemistry.
Chemical aspect of immunology.

2. Department of Pharmaceutical Technology

The pharmaceutical practices and legislation (prescription execution and pharmacotechnical tasks at the Pharmacy and the Hospital).

The consideration of pharmaceutical agents and preparations and of their application and action systems (physical and physiochemical laws) from a physiopharmaceutical point of view.

The basic pharmacotechnical elaborations at semi-industrial and industrial scale of the raw material and pharmaceutical agents, as well as their design, technology and formatting into preparations and cosmetics.

The assessment of the quality of medicines, cosmetics and generally of natural products, of preparations and substances by applying control methods (physiochemical, technological, microbiological, in vivo, etc.).

The pharmaceutical technology of the preparations and the factors affecting their efficiency during their in vivo implementation.

The technological study of factors affecting the obtaining, treatment and control of natural products and of their components.

3. Department of Pharmacognosy-Pharmacology

a. Pharmacognosy

The chemistry of natural products (of vegetative, animal, mineral origin), that is, isolation of active components, identification, control and chemical study (General Pharmacognosy / Drug - chemistry).

The pharmaceutical study of medicines and aromatic plants (essential oils, alkaloids, etc.: analysis, standards and improvement methods). Description of medicines, classification, microscopic control, isolation, identification, control and biogenesis of their natural products. (Applied Pharmacognosy).

The implementation of physiochemical methods used in Pharmacognosy.

Biotechnology of Pharmaceutical Plants

b. Pharmacology

The pharmacological development of new medicines, the improvement of known pharmaceutical agents and the study of the structure and pharmacological action at biochemical, molecular level (in vitro), as well as in situ (isolated organs) and in vivo (guinea pigs). The pharmacodynamic study of the pharmacological actions, undesirable effects, and interactions between medicines.

The analysis of the action of chemotherapeutic agents for microbial infections, parasitic diseases, viruses and neoplasms.

The pharmacological analysis and clinical testing of medicines (absorption, distribution, elimination mechanisms of medicines), dosage determination, therapeutic protocols, medicine interactions.

The pharmacogenetic study of the idiosyncrasy, metabolism, addiction, psychic and natural dependence and resistance to medicines.

The immunopharmacological analysis of allergenic factors, pharmaceutical agents, mechanisms of immunosuppression by medicines and the pharmacological basis of hyperaesthesia phenomena.

The toxicological study of medicine undesirable effects mechanisms, of natural products, poisons, teratogens and mutagens in vitro or in vivo.

The study of the pharmacological action of micro-molecular factors (vaccines, sera, proteins, hormones, etc.) and of microorganisms' metabolism products, which are prepared with biotechnology methods.

Development of therapeutic reagents for neurodegenerative diseases.

b) Academic Disciplines

The academic disciplines of the School's Departments, that include the above mentioned scientific disciplines on a theoretical and on a practical level, consist of the following courses:

1) Department of Pharmaceutical Chemistry

- Inorganic Pharmaceutical Chemistry (Compulsary)
- Pharmaceutical Chemistry (Organometallic compounds and hormones) (Compulsary)
- Organic Pharmaceutical Chemistry (I to III) (Compulsary)
- Organic Pharmaceutical Chemistry (Elective)
- Radiopharmaceutical Chemistry (Compulsary)
- History and Objectives of Pharmacy (Elective)

2) Department of Pharmaceutical Technology

- Pharmaceutical Analysis (I and II) (Compalsary)
- General Pharmaceutical Technology (Compalsary)

- Prescription Techniques (Compulsary)
- Physical Pharmacy (Compulsary)
- Biopharmacy (Compulsary)
- Special Pharmaceutical Technology (I and II) (Compulsary)
- Drug Quality Control (Compalsary)
- Cosmetics (Elective)
- Drug Quality Control (Compulsary)
- Pharmaceutical Technology (Elective)
- Prescription Techniques (Elective)

3) Department of Pharmacognosy - Pharmacology

- Cell Biology (Compulsary)
- Molecular Biology (Elective)
- Pharmacognosy (I, II, III) (Compulsary)
- Pharmacology (I and II) (Compulsary)
- Toxicology (Compulsary)
- Chemistry of Natural Products (Elective)
- Clinical Pharmacokinetics (Compulsary)
- National and European Drug Legislation (Elective)
- Bionformatics (Elective)
- Pharmaceutical Biotechnology (Compulsary)
- Clinical Pharmacology and Therapeutics (Compulsary)
- Biotechonology of Pharmaceutical Plants

c) Departmental Staff

Department of Pharmaceutical Chemistry

FACULTY MEMBERS:

1. DEMOPOULOS Vassilis	Professor, Degree in Pharmacy (U. Athens), Ph.D. (Iowa State University, USA)
2. HADJIPAVLOU-LITINA Dimitra	Professor, Degree in Pharmacy, (AUTH), Doctorate (AUTH)
3. GERONIKAKI Athena	Professor, Degree in Chemistry (State University of Taschent, Uzbekistan), Degree in Pharmacy, (AUTH), M.Sc.

	State University of Taschent, Uzbekistan and Doctorate (Institute of Plant Substances of Uzbek Academy of Science)
4. REKKA Eleni	Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH)
5. NIKOLAOU Ioannis	Lecturer, Degree in Pharmacy (AUTH), Doctorate (AUTH)
6. PAPAGIANNOPOULOU Dionysia	Asistant Porfessor, Degree in Pharmacy (U.Athens), Doctorate (U. Athens)

REGULAR LABORATORY TECHNICIANS (RLT's):

1. GAVALAS Antonios	Degree in Pharmacy (AUTH), Doctorate (AUTH)

OFFICE CLERK: DIAMANTI Maria

Department of Pharmaceutical Technology

FACULTY MEMBERS:

1. KOUNDOURELLIS Ioannis	Professor, Degree in Pharmacy (AUTH), M.Phil., Ph.D. (University of Bath, UK)
2. MALAMATARIS Stavros	Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH), Ph.D. (University of London, UK)
3. KATSIOTIS Stavros	Associate Professor, Degrees a) in Pharmacy, b) in Pharmaceutical Chemistry and Technology (University of Bari, Italy), Doctorate (AUTH)

4. NIKOLAKAKIS Ioannis	Assistant Professor, Degree in Pharmacy (U. Athens), Ph.D. (University of London, UK)
5. KACHRIMANIS Kyriakos	Assistant Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH)
6. MARKOPOULOU Catherine	Assistant Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH)
7. FATOUROS Dimitrios	Assisistant Professor, Degree in Chemistry (University Patras), Doctorate (University of Patras)
8. PANAGOPOULOU Athanasia	Lecturer, Degree in Pharmacy (AUTH), Doctorate (AUTH)

REGULAR LABORATORY INSTRUCTORS (RLI's):

1. ATHANASIOU Anastasios	Degree in Pharmacy (AUTH)

Department of Pharmacognocy - Pharmacology

FACULTY MEMBERS:

1. TSIFTSOGLOU Asterios	Professor, Degree in Pharmacy, (AUTH), M.Sc., M.Phil., Ph.D. (Yale University, USA)
2. SKLAVIADIS Theodoros	Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH)
3. KANELLIS Angelos	Professor, Degree in Agriculture (Agricultural University of Athens), M.Sc. (University of California, Davis, USA), Ph.D. (University of Maryland, College Park, USA)
4. KOKKALOU Evgenios-Konstantinos	Professor, Degree in Pharmacy (AUTH), Doctorate (U. Athens)
5. NIOPAS Ioannis	Professor, Degree in Pharmacy (AUTH), Degree in Chemistry (AUTH), Degree in

	Business Administration (UOM), Ph.D. (University of Strathclyde, Glasgow, UK)
6. PANAGIOTIDIS Christos	Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH)
7. VIZIRIANAKIS Ioannis	Associate Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH)
8. PAPADOPOULOU Lefkothea	Associate Professor, Degree in Pharmacy (AUTH), Doctorate (AUTH)
9. LAZARI Diamanto	Asistant Professor, Degree in Pharmacy (U. Athens), Doctorate (U. Athens)

REGULAR LABORATORY INSTRUCTORS (RLI's):

1. GAVRIELI Chrysi	Degree in Pharmacy (AUTH), Doctorate (AUTH)

REGULAR LABORATORY TECHNICIANS (RLT's)

2. GONIADOU Sofia	Degree of the Technical School «Euclides»
3. **Viarou Chrisanthi**	Librarian

UNDERGRADUATE STUDIES

UNDERGRADUATE STUDIES AT THE SCHOOL OF PHARMACY

In 1990-91 the School of Pharmacy adopted a new, semester-based, curriculum. Furthermore, in a 1992 meeting, the General Assembly of the School determined the Departments that are responsible for the teaching of those courses which belong to the scientific disciplines of other schools.
Starting from the academic year (2004-2005), the School introduced the concept of Academic Advising for undergraduate students. Every student entering the School of Pharmacy shall be assigned by the School to a faculty member who will serve as the student's advisor for the duration of the student's undergraduate studies in this school. The Academic Advisor will regularly be updated on the academic progress of the assigned students and will offer them guidance on academic matters. This initiative is realized through a wider Undergraduate Studies Reformation Program undertaken by the School of Pharmacy since April 2003, which is funded by a competitive grant (EPEAEK II) of the Ministry of Education.
The following information is included for the students:

a) Excerpts from articles 24 and 25 of the amended law 1268/82, and some basic notions and definitions necessary for the reading of the curriculum.
b) The curriculum, instituted in 1990-91 and implemented starting with the class entering the School in 1991-92, and
c) The integration in the sections of the School of Pharmacy of those courses which are taught by faculty members of other Schools.

a) Basic notions and definitions

Each academic year is divided into the fall semester and the spring semester. The courses of the curriculum are divided into required courses and electives and are allocated to eight (8) semesters. Courses of the 1st, 3rd, 5th and 7th semesters of the indicative curriculum are taught during the fall semester. Courses of the 2nd, 4th, 6th and 8th semesters of the respective curriculum are taught during the spring semester
The training of the students of the School of Pharmacy is achieved through lectures, tutorials and laboratory exercises.

a) Required courses

The required courses are those which are compulsory for all the students of the School of Pharmacy to take and to be successfully examined in.
Attendance of the lectures of the courses constitutes a purely academic obligation of the student, that is to say it is not compulsory and there is no system of absence registration. Nevertheless, the regular attendance of the lectures is absolutely advisable for the correct theoretical training of the student. Only this direct contact with the teacher can lead to the accurate knowledge of the subject matter of each course.
Examinations are conducted by the teacher (or the teachers) at the end of the semester on specified material. The examinations can be written or oral. Courses are graded on a scale from zero to ten (0-10), without use of fractional parts and with five being the standard passing grade.

b) Electives

The electives are the courses a student can choose from a list in order to achieve the necessary number of courses and the minimum number of credit hours, which are required for the degree in Pharmacy. The student is free to select these courses according to his/her personal interests.
Elective course examinations, grading and credit hour numbers follow the same rules as the required courses (see part a, above). In case of failure, the student can re-enroll to the elective course and to attend it in a future semester or to enroll to another elective course instead.

c) Laboratory Exercises

Many of the required or elective courses are accompanied by training sessions for the students in premises specially equipped with instruments and devices (Laboratories). The content of these laboratory exercises is related to the content of the course itself or to a relevant course of a previous semester.
The practice of the students into laboratories is compulsory, and for practical reasons (limited number of places in comparison to the total number of students that have to practice) the participation to the laboratory sessions takes place on a specific period of time.
The obligations of the student in the laboratory end when he/she has successfully completed all the exercises expected by the curriculum of each laboratory. In case of absence or failure, the exercises are performed or repeated after consultation with the laboratory's manager, during a future laboratory period or during the same period, provided that this is possible.
During the laboratory exercises the students are graded. Each laboratory, according to its particularities, determines the way of calculation of the respective grade in practical exercises.
In general, the grade in practice is determined on the basis of one or more of the following criteria:

1. The performance, the active participation and the dexterity of the student, the successful execution of exercises, as well as the quality and completeness of the laboratory reports.
2. The result of the improvised written or oral examinations on subjects that usually concern the exercise of the day or the content of the already performed exercises.
3. The result of the practical written or oral examinations, on a pre-determined subject matter, in which the student participates only after the successful accomplishment of all the anticipated laboratory exercises.

d) Tutorials

The tutorial exercises or tutorial courses, are not self-contained courses; rather, they constitute an integral part of many required and elective courses. The tutorials can be taking place within the context of the laboratory exercises (laboratory tutorial courses) during hours determined by each laboratory, according to its particularities. The attendance of the lecture tutorial courses is particularly useful but it is still just an academic obligation of each student. On the contrary, the attendance of the laboratory tutorial courses is compulsory because it is directly related to subjects of practical manipulations and laboratory safety.

b) Reformation of the Undergraduate Studies Program
Department of Pharmacy
Aristotle University of Thessaloniki

The new Undergraduate Educational Program was a combined effort of the "Reform Committee" (past and newly appointed), the chairman and the

General assembly of the department. It was revised to integrate current knowledge accumulated via the rapid developments in Biomolecular Sciences, Pharmacology, Pharmaceutical Technology, Pharmacy, Medicinal Chemistry, Drug Quality Control and Pharmaceutical Analysis as well as Pharmaceutical Biotechnology. The central point throughout the long process of reformation of the undergraduate program of Pharmacy has been the establishment of a more flexible, enriched in contemporary knowledge program in Pharmaceutical Sciences. We should not forget that we are a professional school awarding degrees in Pharmacy and serving public health as well.

Each course has been designated by a code name bearing letters indicative of either Basic background education in Chemistry, Biology, Math, Computing etc or Pharmaceutical education as well as numbers showing the semester in which is available. The directions I and II of courses in the old version of undergraduate program have been abolished and replaced by a number of elective courses.

It is a five-year program which includes 8 teaching semesters (lectures, tutorials, plus labs) as well as a 5^{th} year of practical training Pharmacy (done in Hospital and Community Pharmacies). Each academic year is divided into the fall semester and the spring semester. The courses of the curriculum are divided into required courses and electives and are allocated to eight (8) semesters. Courses of the 1^{st}, 3^{rd}, 5^{th} and 7^{th} semesters of the indicative curriculum are taught during the fall semester. Courses of the 2^{nd}, 4^{th}, 6^{th} and 8^{th} semesters of the respective curriculum are taught during the spring semester.

The recently reformed undergraduate program will be attented by the newly arrived students (first year students) in the academic year 2008-2009.

The modules were set under basic frame Law N. 1268/82 which has been reformed by the new Law N. 3549/07.

CURRICULUM

SEMESTER 1

REQUIRED COURSES

CODE	TITLE	L	P	T	ECTS	TYPE
1	GENERAL MATHEMATICS	3	-	-	7	COMPULSARY
2	GENERAL PHSICS	3	-	-	7	COMPULSARY
NP-01	ΓΕΝΙΚΗ ΚΑΙ ΑΝΟΡΓΑΝΗ ΧΗΜΕΙΑ	3	2	-	7	COMPULSARY
NP-02	ANALYTICAL CHEMISTRY	3	3	-	6.5	COMPULSARY
NP-06	ENGLISH A (1/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-07	FRENCH A (1/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-08	GERMAN A (1/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-09	GREEK A (1/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-10	ITALIAN A (1/4)	2	-	-	0.5	FOREIGN LANGUAGE

The students must choose one elective from the following:

CODE	TITLE	L	P	T	ECTS	TYPE
NP-03	HISTORY AND OBJECTIVES OF	2	-	-	2	ELECTIVE

	PHARMACY					
NP-04	OPERATING PRINCIPLES AND APPLICATIONS OF COMPUTERS AND INTERNET	2	-	-	2	ELECTIVE

Total CR of 1st semester: 30 ECTS

SEMESTER II

REQUIRED COURSES

Code	ΤΙΤΛΟΣ	L	P	T	ECTS	TYPE
8	GENERAL ORGANIC CHEMISTRY	3	2	-	8	COMPULSARY
9	CELL BIOLOGY	3	2	-	6	COMPULSARY
7	BOTANIC	2	2	-	4	COMPULSARY
NP-26	MICROBOLOGY/IMMUNOLOGY	2	2	-	3.5	COMPULSARY
NP-27	PHYSICAL CHEMISTRY	3	2	-	6	COMPULSARY
NP-11	ENGLISH B (2/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-12	FRENCH B (2/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-13	GERMAN B (2/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-14	GREEK B (2/4)	2	-	-	0.5	FOREIGN LANGUAGE

NP-15	ITALIAN B (2/4)	2	-	-	0.5	FOREIGN LANGUAGE

The students must choose one elective from the following:

CODE	TITLE	L	P	T	ECTS	TYPE
NP-28	HYGIENE/EPIDIMIOLOGY	2	2	-	2	ELECTIVE
NP-29	ENZYMOLOGY	2	2	-	2	ΕΠΙΛΟΓΗΣ

Total CR of 2nd semester: 30 ECTS

SEMESTER III

REQUIRED COURSES

CODE	TITLE	L	P	T	ECTS	TYPE
NP 30	PHYSIOLOGY I	2	2	-	4	COMPULSARY
22	SPECIFIC ORGANIC CHEMISTRY	3	2	-	7	COMPULSARY
21	BIOCHEMISTRY I	2	2	-	3.5	COMPULSARY
20	INORGONIC PHARMACEUTICAL CHEMISTRY	2	2	-	6	COMPULSARY
23	PHARMACEUTICAL ANALYSIS I	2	2	-	7	COMPULSARY
NP-16	ENGLISH C (3/4)	2	-	-	0.5	FOREIGN

						LANGUAGE
NP-17	FRENCH C (3/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-18	GERMAN C (3/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-19	GREEK C (3/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-20	ITALIAN C (3/4)	2	-	-	0.5	FOREIGN LANGUAGE

The students must choose one elective from the following:

CODE	TITLE	L	P	T	ECTS	TYPE
29	ANATOMY	2	2	-	2	ELECTIVE
84	MOLECULAR BIOLOGY	2	2	-	2	ELECTIVE

Total CR of 3rd semester: 30 ECTS

SEMESTER IV

REQUIRED COURSES

CODE	TITLE	L	P	T	ECTS	TYPE
33	PHARMACEUTICAL ANALYSIS	2	2	-	7	COMPULSARY
34	PHARMACEUTICAL CHEMISTRY (HORMONES,	3	2	-	7	COMPULSARY

	ORGANOMETALICS)					
31	BIOCHEMISTRY II	3	-	-	3.5	COMPULSARY
46	GENERAL PHARMACEUTICAL TECHNOLOGY	3	2	-	6	COMPULSARY
NP-31	PHYSIOLOGY II/ HUMAN PATHOPHYSIOLOGY	3	2	-	4	COMPULSARY
NP-21	ENGLISH Δ (4/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-22	FRENCH D (4/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-23	GERMAN D (4/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-24	GREEK D (4/4)	2	-	-	0.5	FOREIGN LANGUAGE
NP-25	ITALIAN D (4/4)	2	-	-	0.5	FOREIGN LANGUAGE

The students must choose one elective from the following:

CODE	TITLE	L	P	T	ECTS	TYPE
ΝΠ-32	IMMUNOBIOLOGY/ IMMUNOCHEMISTRY	2	2	-	2	ELECTIVE
80	CLINICAL CHEMISTRY	2	2	-	2	ELECTIVE

Total CR of 4th semester: 30 ECTS

SEMESTER V

REQUIRED COURSES

CODE	TITLE	L	P	T	ECTS	TYPE
48	ORGANIC PHARMACEUTICAL CHEMISTRY	3	2	-	6.5	COMPULSARY
32	DISPENSING	2	2	-	6.5	COMPULSARY
49	PHARMACOLOGY I	3	2	1	6.5	COMPULSARY
NP-33	PHARMACOGNOCY I	3	2	-	6.5	COMPULSARY
50	PHYSICAL PHARMACY	2	-	4	4	COMPULSARY

Total CR of 5th semester: 30 ECTS

SEMESTER VI

REQUIRED COURSES

CODE	TITLE	L	P	T	ECTS	TYPE
51	BIOPHARMACEUTICS	2	2	-	4	COMPULSARY
52	SPECIFIC PHARMACEUTICAL TECHNOLOGY	3	2	1	5.5	COMPULSARY
54	ORGANIC PHARMACEUTICAL CHEMISTRY II	3	2	-	5.5	COMPULSARY

55	PHARMACOLOGY II	3	2	1	5.5	COMPULSARY
NP-34	PHARMACOGNOSY II	3	2	-	5.5	COMPULSARY

The students must choose one elective from the following:

Κωδικός	**ΤΙΤΛΟΣ**	**Θ**	**Ε**	**Φ**	**ECTS**	**ΤΥΠΟΣ**
NP-48	EMERGENCY TREATMENT	2	2	-	4	ELECTIVE
NP-47	BIOINFORMATICS	2	2	-	4	ELECTIVE
NP-41	NATIONAL AND EUROPEAN DRUG LEGISLATION	2	2	-	4	ELECTIVE

Total CR of 6th semester: 30 ECTS

SEMESTER VII

REQUIRED COURSES

CODE	**TITLE**	**L**	**P**	**T**	**ECTS**	**TYPE**
71	TOXICOLOGY	3	2	-	5	COMPULSARY
70	ORGANIC PHARMACEUTICAL CHEMISTRY III	3	2	-	8	COMPULSARY
NP-35	PHARMACEUTICAL BIOTECHNOLOGY	3	2	-	4	COMPULSARY

66	SPECIFIC PHARMACEUTICAL TECHNOLOGY II	3	2	-	6	COMPULSARY
NP-36	{HARMACOGNOSY III	3	2	-	7	COMPULSARY

Total CR of 7th semester: 30 ECTS

SEMESTER VIII

REQUIRED COURSES

CODE	TITLE	L	P	T	ECTS	TYPE
NP-38	ORGANIC AND RADIOPHARMACEUTICAL CHEMISTRY	2	2	-	4	COMPULSARY
NΠ-37	CLINICAL PHARMACOLOGY AND THERAPEUTICS	3	2	-	5	COMPULSARY
79	CLINICAL PHARMACOKINETICS	3	2	-	5	COMPULSARY
69	DRUG QUALITY CONTROL	2	2	-	4	COMPULSARY

The students must choose a) three elective courses or b) one elective course and dissertation which is equivalent with two elective courses (8 ECTS) from the following:

CODE	TITLE	L	P	T	ECTS	TYPE
NP-46	ORGANIC PHARMACEUTICAL	2	2	-	4	ELECTIVE

	CHEMISTRY					
NP-45	PHARMACEUTICAL TECHNOLOGY	2	2	-	4	ELECTIVE
NП-44	CHEMISTRY OF NATURAL PRODUCTS	2	2	-	4	ELECTIVE
NП-43	BIOTECHNOLOGY OF PHARMACEUTICAL PLANTS	2	2	-	4	ELECTIVE
NP-42	DRUG QUALITY CONTROL II	2	2	-	4	ELECTIVE
NP-40	COSMETICS	2	2	-	4	ELECTIVE
NP-39	NON PRESCRIPTION DRUGS	2	2	-	4	ELECTIVE
DE2	DISSERATION 2/2				4	ELECTIVE
DE1	DISSERTATION 1/2				4	ELECTIVE

Total CR of 8th semester: 30 ECTS

SEMESTER IX

Required Practical Training of 9th Semester

CODE	**TITLE**	**L**	**P**	**T**	**ECTS**
PA-1	PRACTICAL TRAINING	-	-	-	30

Total CR of 9th semester: 30 ECTS

SEMESTER X

Required Practical Training of 9th Semester

CODE	TITLE	L	P	T	ECTS
PA-2	PRACTICAL TRAINING	-	-	-	30

Total CR of 10th semester: 30 ECTS

L: Lecture, **P:**Practicals, **T:**Tutorials

Integration of courses taught by the faculty of other AUTh Schools and Departments

The General Assembly (GA 135/16-9-92) has determined the Departments of the School of Pharmacy which are to be responsible for the teaching of the courses that belong to the scientific disciplines of other schools and departments of the University, as follows:

Course	Department
General Mathematics	Pharmaceutical Technology
General Physics	Pharmaceutical Technology
General and Inorganic Chemistry	Pharmaceutical Chemistry
Analytical Chemistry	Pharmaceutical Chemistry
Computing - Internet	Pharmaceutical Technology
Botany	Pharmacognosy – Pharmacology
General Organic Chemistry	Pharmaceutical Chemistry
Microbiology - Virology	Pharmacognosy – Pharmacology
Biochemistry I, II	Pharmacognosy – Pharmacology
Organic Chemistry	Pharmaceutical Chemistry
Physical Chemistry	Pharmaceutical Technology
Anatomy	Pharmacognosy – Pharmacology
Physiology	Pharmacognosy – Pharmacology
Enzymology	Pharmacognosy – Pharmacology
Hygiene	Pharmacognosy – Pharmacology
Emergency Medical Treatment	Pharmacognosy – Pharmacology
Clinical Chemistry	Pharmacognosy – Pharmacology

SEMESTER DISTRIBUTION OF COURSES

SEMESTER I

GENERAL MATHEMATICS

Code number: 1

Cycle: 1st / Undergraduate

Semester: 1st

Course type: Compulsory (Core)

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 7

Lectures (hours/week): 2h

Tutorial (hours/week): 1h

Laboratory work (hours/week): -

Course coordinator: Assist. Prof. DESPINA PAPADOPOULOU

Tutor (s): Assist. Prof. DESPINA PAPADOPOULOU

Assisting personnel: -

Aims of the course: Obtaining and understanding the basic knowledge of Mathematics on the following topics: i) Linear Algebra (Theory of Matrices and systems of linear equations). ii) Analytic Geometry in the plane (straight line, conics, transformations) and in the three - dimensional space

(straight line, plane, sphere). iii) Differentiation and integration of functions. iv) Ordinary differential equations of first order.

Skills: The students familiarise themselves with the mathematical concepts and methods of the above topics and obtain the ability to use them, as a tool for understanding better subjects on their scientific area. Moreover, they develop the critical way of thinking and apply it in practice.

Teaching methods: Attending lectures, tutorial.

Contents of the course: Linear Algebra: Matrices - Determinants – Systems of linear equations.
Analytic Geometry in the plane: The straight line - The circle – The parabola - The ellipse - The hyperbola - The general equation of second degree - Translation of axes - Rotation of axes.
Analytic Geometry in the three - dimensional space: Equations of a line - The plane - The sphere.
Calculus: Derivative and differential of a function of one variable or two variables (Partial derivatives). Integration of functions
Ordinary differential equations of first order.

Proposed literature: 1) D. Demetropoulou-Psomopoulou. Elements of General Mathematics, 2nd edition, Ziti Pelagia & Sia Publications, Thessaloniki 1992.
2) P. Moisiadis. Higher Mathematics, 6th edition, A. and P. Christothoulidou Publications, Thessaloniki 2000.
3) T. Kiventithis. Higher Mathematics (volume I), 1st edition, Ziti Pelagia & Sia Publications, Thessaloniki 2005.

Lecture	Title	Tutor
1 - 2	Matrices – special matrices – actions – properties of matrices	D.PAPADOPOULOU
3 - 4	Elementary transformations of a matrix – equivalent matrices – rank of a matrix	D.PAPADOPOULOU
5 - 6	Determinants – inverse matrix	D.PAPADOPOULOU
7 - 8	Systems of linear equations	D.PAPADOPOULOU
9 - 10	Exercises on the previous chapter *	D.PAPADOPOULOU

11 - 12	Analytic Geometry in the plane: The straight line - The circle – The parabola - The ellipse - The hyperbola - The general equation of second degree - Translation of axes - Rotation of axes.	D.PAPADOPOULOU
13	Exercises on the previous chapter *	D.PAPADOPOULOU
14	Functions of one variable – Inverse functions - The Derivative - Formulas and methods of differentiation	D.PAPADOPOULOU
15 - 16	Differential of a function- Implicit differentiation - Higher order derivatives – Functions of two variables - Partial derivatives – The total differential	D.PAPADOPOULOU
17 - 18	Exercises on the previous chapter *	D.PAPADOPOULOU
19	The integral - Formulas and methods of integration	D.PAPADOPOULOU
20-21	Ordinary differential equations of first order	D.PAPADOPOULOU
22-23	Exercises on the two previous chapters *	D.PAPADOPOULOU
24-25	Analytic Geometry in the three - dimensional space: Equations of a line - The plane - The sphere.	D.PAPADOPOULOU
26	Exercises on the previous chapter *	D.PAPADOPOULOU

Educational activities: Lectures and tutorial

Evaluation process and methods: Written exam at the end of semester (2,5 h).

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures: -

Teaching:
Lectures and Tutorial*

INTRODUCTORY PHYSICS

Course code: 2
Course level: Undergraduate
Semester: 1st semester

Educational level: Introductory
Subject area: Physics for Pharmacy students

ECTS (European Credit Transfer and Accumulation System): 3
Theory (hours/week): 4
Recitations (hours/week): -
Laboratory practice (hours/week): -
Coordinator: Professor Eleni C. Paloura

Lecturers	**Contact information**
Dr. Eleni C. Paloura, Professor	Office location: School of Science, 2nd Floor, Department of Solid State Physics Student hours: Monday to Friday 12^{00}-13^{00} e-mail: paloura@auth.gr Website: http://users.auth.gr/~paloura
Dr. Maria Katsikini, Assist. Professor	Office location: School of Science 2nd Floor, Department of Solid State Physics Student hours: Monday to Friday 12^{00}-13^{00} e-mail: katsiki@auth.gr Website: http://users.auth.gr/katsiki

Teaching assistants: -

Learning outcomes: At the end of the course the students will have attained a working knowledge of fundamental principles of Classical and Modern Physics, their applications towards understanding functions of the human body and operation principles of certain diagnostic techniques. In addition to that, the students will have developed problem solving skills. The lecture contents are the following:

- Nature of fundamental forces and application of laws of classical mechanics in the study of equilibrium of various parts of the human body as well as of the estimation the applied tension and compression.
- Properties of liquids and fundamental laws that govern their equilibrium and motion.
- Various cases of motion, e.g. oscillations.
- Waves in elastic media and sound waves, specific cases of electromagnetic waves e.g. light and X-rays.
- Properties and applications of ultrasonic waves, X-rays, laser light and optical fibers for diagnostic and therapeutical purposes.
- The concepts of work and energy, temperature and heat, energy interchange related with metabolism and energy balance in the human body.
- Fundamental concepts of bioelectricity and more specifically propagation of electrical signals in cells (mainly nervous cells) as well as fundamentals of diagnostic techniques based on bioelectricity (e.g. electro-cardiography, -myography, -encephalography).
- The concept of scaling in physics and its application in living organisms.
- Experimental data evaluation and assessment and measurement errors.

Skills: Basic knowledge of physics and applications in the human body as well in diagnostic methods.

Teaching methods: Lectures and problem solving sessions

Course description:

1. Introduction to the graphical representation of data, errors, error propagation and fitting.

Common types or experimental errors, error propagation, precision and accuracy, significant digits, histograms, Gaussian distribution, standard deviation and standard error. Data plots in linear, log-log and semi-log scales. Least square fitting.

2. The problem of scaling in living organisms

Definition and applications of scaling. Volume- and surface-dependent quantities and examples on the use of scaling: cell division, diving duration, heart rate etc

3. Equilibrium of rigid bodies: forces and torques

Force as a vector quantity, equilibrium of point masses, Newton's laws, inertia, mass and weight. Nature of fundamental forces (contact forces and distant actions). Gravitational, muscular and frictional forces. Backbone loads. Pulleys and strings. Torque and equilibrium of rigid bodies, center of mass, stability of equilibrium, levers, skeletal muscles, equilibrium of parts of the human body.

4. Work- Energy-metabolism

Definitions of work, energy and mechanical energy. Isolated system. Principles of Thermodynamics. The human body as a heat engine and its energy needs, metabolism.

5. Fluid mechanics

Properties of fluids, definition of force and pressure. Pascal's principle, buoyant force and Archimedes's principle, manometers, buoyant floating, adhesive and cohesive forces, surface tension, capillaries, surfactants. Fluid motion, Bernoulli's equation, continuity equation, Poiseuille's law, viscosity, viscous and turbulent flow. Blood circulation in the human body, arteriosclerosis, measurement of blood pressure. Ventouri's tube, Torricelli's theorem.

6. Oscillations and waves

Definition of oscillations and harmonic oscillations. Spring-mass system and simple (mathematical) pendulum: differential equation of motion, equations of displacement, velocity and acceleration and principle of conservation of energy. Physical pendulum, moment of inertia, walking legs as physical pendulum. Definition of wave (mechanical, electromagnetic), transverse and

longitudinal, harmonic traveling and standing waves. Fundamental wave equation. Standing waves on a taut string.

7. Sound waves

Definition of sounds, ultrasounds and infrasounds. Sound propagation in elastic media. Intensity and audibility, pitch, loudness and timbre, effect of noise on the human physiology. Applications of ultrasounds, echo, reverberation and echo. Beats, Doppler effect and its applications.

8. Geometrical Optics- Optical devices – Laser

Nature of light. Light sources. Definition of geometrical optics, formation of umbra and penumbra. Laws of reflection and image formation from plane and curved mirrors. Laws of refraction, dispersion, total reflection, optical fibers, prisms, lenses. Image formation from converging and diverging lenses. Equation of lenses. Description of the human eye and image formation in retina, eye adaptation, refractive anomalies of the eye and correction using lenses. Angular magnitude and magnification, simple and compound microscope. Working principle, properties and applications of laser.

9. Temperature and Heat

Definitions of internal energy, temperature and heat. Temperature scales. Principles of operation and applications of different thermometers. Thermal expansion of solids and liquids, phase changes. Heat transfer mechanisms. Black body radiation, the laws of Stefan-Boltzmann and Wien and their applications. Green house effect. .

10. X-rays

Mechanism for X-ray emission and X-ray properties. Operation principle of the Coolidge tube. Moseley's law. Bremsstrahlung and characteristic X-ray line spectra. Interaction of X-rays with matter, absorption of X-rays. X-ray detectors. X-ray applications in medical diagnosis. Units of ionizing radiation. Novel sources of X-ray production (synchrotron sources).

11. Bioelectricity

Electrical signals in the human body and their measurement. Nervous system, neurons, synapses. Electric potential and polarization of cell membrane, Nernst potential. Action potential and signal propagation along neurons. Working principle of electro-, myo- and -encephalography

Recommended textbooks

1α. «Physics with applications in Biology" (in Greek) K. Kambas et al, Giahoudi Publications, Thessaloniki 1988
2. «Physics in Biology», P. Davidovits (translated in Greek), Parisianos Pub;lications, Athens 2011 .
3α. «University Physics" Vol.1, Young Hugh D. (translated in Greek), Papazisi Publications, Athens 1995
3β. «University Physics" Vol.2, Young Hugh D. (translated in Greek), Papazisi Publications, Athens 1995

Teaching and learning methods: Lecture attendance and problem solving sessions.

Assessment methods:
Assessment is through a written final examination at the end of the semester. The students are usually asked to answer 4 questions that include both theory and problems. The 4 individual questions are equivalent in terms of the credit points. The examination is typically 60-90 min long. The examination schedule is issued by the School of Pharmacy.

Use of ICTs: The lectures and the problem solving sessions are based on the use of ICTs (Powerpoint). Copies of the lecture notes, the homework sets and all related announcements can be found in the WebPages of the Lecturers.

Teaching: The teaching of the course is based on lectures and problem solving sessions (Room A11 in the School of Science). The teaching schedule includes two lectures per week and each lecture is 2-hrs long. ICTs are extensively used. Copies of the lecture notes can be found in the WebPages of the Lecturers (free access).

Calendar		
Lecture	**Title**	**Lecturer**
1	Introduction. Scaling in Physics.	M. Katsikini
2	Introduction to error analysis and graphical presentation of data, homework solutions.	E. C. Paloura
3	Newton's Laws for motion, equilibrium of point masses.	M. Katsikini

4	Types of forces (distant action and contact forces, gravitational, frictional and muscular forces).	M. Katsikini
5	Torque, center of mass, equilibrium of rigid bodies, the human body and its parts.	M. Katsikini
6	Problem solving (forces and torques)	M. Katsikini
7	Fluid mechanics I: definitions and characteristic properties of fluids, force, pressure, Pascal's principle and its applications.	E. C. Paloura
8	Fluid mechanics II: Archimedes principle, surface tension, adhesion and cohesion forces, capillary effects, surfactants.	E. C. Paloura
9	Fluid mechanics III: Fluid motion, viscosity, Bernoulli equation, laws of Poisseuille and Torricelli, Venturi tube, blood circulation, homework solutions.	E. C. Paloura
10	Work, energy, heat, principles of thermodynamics.	M. Katsikini
11	Energy needs of the human body, metabolism, homework solutions.	M. Katsikini
12	Heat I: Types of thermometers, thermometric scales and their applications, effects that accompany the temperature variations (contraction, expansion, phase transition), heat capacity and specific heat.	E. C. Paloura
13	Heat II: Mechanisms of heat propagation and applications, black body radiation and applications, homework solutions.	E. C. Paloura
14	Oscillations, simple and compound pendulum, walking legs as physical pendulum, normal walking rate.	M. Katsikini
15	Waves in elastic media, problem solution (oscillations, waves)	M. Katsikini
16	Sound waves I: definitions, frequency response of the human ear, mechanism and speed of sound propagation, intensity of sound.	E. C. Paloura
17	Sound waves II: audibility, sound intensity, properties and applications of ultrasound, concepts of acoustics.	E. C. Paloura

18	Sound waves III: beats, Doppler effect and applications, homework solutions.	E. C. Paloura
19	Optics I: nature of light**,** reflection and mirrors	M. Katsikini
20	Optics II: refraction of light, prisms, lenses and image formation	M. Katsikini
21	Optics III: Optical devices, human eye, use of lenses for the correction of refractive anomalies of the eye, simple and compound microscope.	M. Katsikini
22	Laser light and its applications, homework solutions.	M. Katsikini
23	X-rays I: Production of X-rays, Coolidge tube, continuous and characteristic line spectrum, Moseley's law.	E. C. Paloura
24	X-rays II: Mechanisms of X-ray interaction with matter. Absorption and protection from X-rays.	E. C. Paloura
25	X-rays III: X-ray detectors and applications, measurement units and impact of ionizing radiation, novel sources for X-ray generation. Homework solutions.	E. C. Paloura
26	Bioelectricity.	M. Katsikini

ANALYTICAL CHEMISTRY

Code number: NP-02

Cycle: UNDERGRADUATE

Semester: 1rst

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 3

Tutorial (hours/week): 0

Laboratory work (hours/week): 3

Course coordinator: JOHN STRATIS

Tutor (s):

I. Stratis, (jstratis@chem.auth.gr)
A. Voulgaropoulos (voulgaro@chem.auth.gr)
G. Zachariadis (zacharia@chem.auth.gr)
A. Anthemidis (anthemid@chem.auth.gr)
S. Girousi (girousi@chem.auth.gr)

Assisting personnel:

-

Aims of the course:

The comprehension from the side of students, of the basic principles of Analytic Chemistry and what are the available methods of classic and modern chemical analysis, which are applied in pharmaceutical analysis. Comprehension of basic analytical procedures like for instance sampling, chemical analysis, titrations, expression of accuracy and precision, statistical analysis of data..

Skills:

To become familiar with basic analytical chemistry procedures and especially of titration and wet chemical analysis.

Teaching methods:

Teaching in the classroom and laboratory exercises.

Contents of the course:

Solutions. Solubility.
Acid base equilibria
Hydrolysis and Buffer solutions
Heterogeneous chemical equilinrium.
Methods of chemical analysis. Analytical chemistry literature.
Concentration. Units.
Descriptive statistics. Problem solving
Statistical analysis of analytical data
Reagents and materials. Sampling procedures
Principles of wet digestion, dry ashing anf fusion techniques in chemical analysis
Basic principles of titration procedures.
Acid base titrations. Indicators.
Acid base titration applications in pharmaceutical analysis. Problem solving.
Complexometric and precipitation titration applications. Problem solving.
Redox and potentiometric titration applications. Problem solving .

Proposed literature:

1. Εισαγωγή στην Ποσοτική Χημική Ανάλυση των Α. Βουλγαρόπουλου, Γ. Ζαχαριάδη και Ι. Στράτη, ΕΚΔΟΣΕΙΣ ΖΗΤΗ, ISBN 960-431-516-1
2. Εργαστηριακές Μέθοδοι Ποσοτικής των Ι. Στράτη, Γ. Ζαχαριάδη και Α. Βουλγαρόπουλου ΕΚΔΟΣΕΙΣ ΖΗΤΗ, ISBN 960-431-586-2
3. Analytical Chemistry, Gary Christian, 2003, 6th edition, John Wiley, USA.
4. Quantitative Analytical Chemistry, Daniel Harris, 5th Edition, W. Freeman, USA

5. Fundamentals of Analytical Chemistry, D.Skoog, D. West, F. Hollas, S. Crouch, Ed. Brooks Cole, USA

Educational activities:
Lectures and experimental exercises.

Evaluation process and methods:
Intermediary evaluation of progress (A) or examination in the end of the semester (B). Written examinations in 5 subjects which are constituted from 2 sub-subjects. All the questions are equivalent and each one receive 1 or 2 units, 10 in total. In case where a subject is not answered by no student, then this subject is withdrawn and the final degree is calculated based on the rest. All students who attend the lectures and complete the laboratory exercises may take part in the examinations.

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures
Powerpoint presentations are used during teaching in the classroom. The presentations are frequently available through the website.

Teaching:
A) **Lectures**.

Lecture	Title	Lecturer
1-2	Solutions. Solubility.	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
3-4	Acid base equilibria	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi

5-6	Hydrolysis and buffer solutions	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
7-8	Heterogeneous chemical equilinrium.	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
9-10	Methods of chemical analysis. Analytical chemistry literature. Concentration. Units.	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
11-12	Descriptive statistics. Problem solving	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
13-14	Statistical analysis of analytical data	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
15-16	Reagents and materials. Sampling procedures	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
17-18	Principles of wet digestion, dry ashing anf fusion techniques in chemical analysis	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
19-20	Basic principles of titration procedures. Acid base titrations. Indicators.	I. Stratis,

		A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
21-22	Acid base titration applications in pharmaceutical analysis. Problem solving.	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
23-24	Complexometric and precipitation titration applications. Problem solving.	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi
25-26	Redox and potentiometric titration applications. Problem solving .	I. Stratis, A. Voulgaropoulos G. Zachariadis A. Anthemidis S. Girousi

B) **Laboratory work**

Lab.	**Title**	**Tutor**
1	Laboratory regulations – Laboratory Safety -	P. Kofos, M. Michail
2	Cations reactions	P. Kofos, M. Michail
3	Cations separation and detection	P. Kofos, M. Michail
4	Examinations	P. Kofos, M. Michail

5	Acid base titrations III	P. Kofos, M. Michail
6	Acid base titrations II	P. Kofos, M. Michail
7	Acid base titrations III	P. Kofos, M. Michail
8	Precipitation titrations	P. Kofos, M. Michail
9	Complexometric titrations	P. Kofos, M. Michail
10	Redox titrations Manganimetry	P. Kofos, M. Michail
11	Redox Titrations Iodometry	P. Kofos, M. Michail
12	Examinations	P. Kofos, M. Michail

ENGLISH LANGUAGE A

Code number: NP-06

Cycle: undergraduate

Semester: 1st

Course type

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 3

Lectures (hours/week): 3

Course coordinator:
Dr Smaragda Christidou-Kioseoglou

Tutor (s):
Dr Smaragda Christidou-Kioseoglou

Assisting personnel:

Aims of the course:
The course aims to familiarize students with the special language and terminology of Pharmacy Science as it is employed in authentic texts of

different genres. It also targets to develop students' reading skills to facilitate the comprehension of the relevant texts.

Skills:
Students will develop the ability to grasp the basic idea (skimming), locate particular information (scanning), recognize common prefixes and guess the meaning of unfamiliar words from the context.

Teaching methods:
Interactive teaching

Contents of the course:

A. Pre-reading activities

Questions to predict the content of the text and activate existing knowledge.

B. Activities following skimming or scanning

General questions, questions for locating specific information, filling diagrams with the main titles of the text, checking the answers of the pre-reading questions.

C. Detailed-reading questions

True-False questions, matching side-titles with paragraphs, filling tables and diagrams.

D. Vocabulary learning activities

Guessing the meaning of unknown words from context, blank filling, matching terms with definitions, understanding the meaning of prefixes and unknown words, synonyms, antonyms.

Proposed literature:

Ziaka, I. 2010. *English for Pharmaceutical Studies*, vol. I . Thessaloniki: University Studio Press.

Educational activities:
Attendance of lectures

Evaluation process and methods:
One final exam at the end of the semester

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

Power point presentations with interactive activities.
Supplementary teaching material is hosted on the Blackboard Platform e-courses, with open access.

Teaching:

A) **Lectures**.

Lecture	Title	Tutor
1	What is "pharmaceutics"?	S. Christidou-Kioseoglou
2	Oral solids, Tablets	
3	Oral liquids	
4	Suspensions	
5	Emulsions, Emulsion Theory	
6	Why and where do drugs work?	
7	The receptor role	

8	Pharmacokinetics	
9	Influenza (Seasonal)	
10	Safety of pandemic (H1N10) 2009 vaccines	
11	Access to medicines	
12	Healthy lifestyle habits among Greek university students	
13	The bacterial cell, Mechanisms of bacterial action	

HISTORY AND OBJECTIVES OF PHARMACY

Code number: NP03

Cycle:
Undergraduate
Semester:
1rst semester

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 2

Lectures (hours/week): 2

Tutorial (hours/week):
-
Laboratory work (hours/week):

Course coordinator:
Dimitra Hadjipavlou-Litina, Professor

Tutor (s):
Dimitra Hadjipavlou-Litina, Professor
Room 408/B & 410, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 11-12.
Communication: e-mail (hadjipav@pharm.auth.gr)

Eleni Rekka, professor
Room 409, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310-997614, e-mail (rekka@pharm.auth.gr)

Diamanto Lazari, assistant professor

Room 317, 3rd floor Biology/Pharmacy building.

Collaboration with students: Every day 11-12.

Communication: 2310-997617, e-mail (dlazari@pharm.auth.gr

Assisting personnel:

Aims of the course:

This course is addressed to 1rst semester young pharmacy students to be acquaintanced with the Pharmaceutical Science, its scope and subjects. The course is not only introductory for the Pharmaceutical Sciences but it might be helpful to the students to explore the historical evolution, the potential and the perspectives of their Scientific field.

During the course the following are presented and explained in summary:

The Curriculum in the School of Pharmacy, the profession of the pharmacist and the specialities.

Drugs- diseases - safe use of medicaments.

Food-health- in correlation to the drugs, similarities, differences.

Need for new drugs, routes for drugs' invention.

The role of the pharmacist (in consideration to all the above mentioned) , ethics in Pharmacy.

Skills:

By the end of this course, the students should be able to know and understand:

The subjects of their Science

The History and the evolution of the Drugs/Pharmacy

The drug development and the appropriate methods used within

The correlation between food and drugs under physiological or pathological conditions

The scientific and professional perspectives of pharmacists in a community

Teaching methods: Lectures

Contents of the course:

Tutors:

1) Dimitra Hadjipavlou-Litina

Introduction

Ancient Eastern civilizations

Pharmaceutical Sciences in Mediteranianduring the Historical periods:

- Pro-Ippocratic period
- Ippocratic period (5th century –Alexander the Great)
- 1-3 rd centuries B.C.

Byzantine period-Middle Ages

Arabs

European period

Alchemists-Alchemy (-chemistry)

Universities (Education)

Pharmaceutical Sciences during 12-17th centuries

2) Eleni A. Rekka

Elements of food, nutrition, in relation to health and drugs. Achievements of Pharmaceutical Sciences. Development of new drugs, methods, purpose. Perspectives of progress in Pharmaceutical Sciences. Organisation and studies at the School of Pharmacy, A.U.T. Pharmaceutical Chemistry: subject, aims, contribution to pharmaceutical education. Professional occupation of pharmacists. Branches in Pharmacy. Elements of Pharmaceutical Deontology.

3) Diamanto Lazari

Pharmacy in the 18th century. Important representatives of this era. Scientific period (from 19th century to present). Homeopathy and Homeopathic Medicines. Greek Pharmacopoeia. National Organization for Medicines (ΕΟΦ). Organisation of studies at School of Pharmacy of Aristotle University of Thessaloniki. Presentation of Scientific Subjects of Departments of Pharmacognosy-Pharmacology and Pharmaceutical Technology.

Proposed literature:

D. Hadjipavlou-Litina

1. History of Pharmacy, G. Fokas
2. American Institute of the History of Pharmacy
3. History of Pharmacy: A Guide and a Survey, E Kremers, G Urdang - 1940 - JB Lippincott Company

E. Rekka

1. S. Anderson, "Making medicines: A brief history of Pharmacy and Pharmaceuticals", Pharmaceutical Press, 2005

D. Lazari

1. www.efe.org.gr

2. www.eof.gr

Educational activities: Lectures, discussion with the students in every lecture.

Evaluation process and methods: Examination is performed at the end of the semester. To compute the final grade, the grade which is given by each tutor (3.33) is added
The duration of the examination is 2 hours for the three tutors.
The examination at the end of the semester is performed at dates, time and place arranged by the department.

Use of TIC / Electronic distribution of the lectures
Lectures, notes, statements etc are presented in the corresponding place of the website of the School of Pharmacy.

Teaching: Teaching of this course is accomplished through lectures

Lecture	Title	Tutor
1	Introduction Ancient Eastern civilizations	D. Hadjipavlou-Litina
2	Historical periods of Pharmaceutical Sciences in Mediteranian	D. Hadjipavlou-Litina

3	Byzantine period, Middle Ages, Arabs, European period, Alchemists, Alchemistry	D. Hadjipavlou-Litina
4	The universities period of pharmaceutical Education, Pharmaceutical Sciences during the 12^{th} -17^{th} centuries	D. Hadjipavlou-Litina
5	HEALTH, FOOD, DRUGS: Evolution from the appearance of humans until today. Relation of food with drugs.	E. Rekka
6	MEDICINES, PHARMACY: Definition, contents. BRANCHES OF PHARMACEUTICAL SCIENCES - Pharmaceutical/Medicinal Chemistry	E. Rekka
7	METHODS OF DRUG DISCOVERY AND DEVELOPMENT: Description, Targets, Significance and usefulness of drugs, Proper use of medicines. The offer of drugs to mankind.	E. Rekka
8	Professional occupation of pharmacists. Branches in Pharmacy. Elements of Pharmaceutical Deontology.	E. Rekka
9-10	Pharmacy in the 18^{th} century. Scientific period (from 19^{th} century to present).	D. Lazari
11	Greek Pharmacopoeia. National Organization for Medicines (ΕΟΦ).	D. Lazari
12	Organisation of studies at School of Pharmacy of Aristotle University of Thessaloniki. Presentation of Departments of Pharmacognosy-Pharmacology and Pharmaceutical Technology.	D. Lazari
13	Future trends in pharmaceutical science-professional outlets in Greece	D. Hadjipavlou-Litina E. Rekka D. Lazari

A) **Lectures**. Lectures (13 of 2 hours each) are given in the lecture room D12 (main building of the School of Natural Sciences)

B) Laboratory work: Not exist

SEMESTER II

GENERAL ORGANIC CHEMISTRY

Code number: CBT25

Cycle : Undergraduate

Semester : 2

Course Type

X	Background / General Knowledge
	Scientific area: Pharmacy

Credit units (ECTS): 8

Lectures (hours per week): 3

Tutorial (hours): -

Laboratory (hours per week): 2

Course coordinator: Konstantinos Litinas, Elisavet Malamidou-Xenikaki

Tutor (s):
1) Konstantinos Litinas,
Office 317, 1st floor, Old Chemistry Building.
Time for collaboration with students: everyday
E-mail:klitinas@chem.auth.gr

2) Elisavet Malamidou-Xenikaki.
Office 302, 1st floor, Old Chemistry Building.
Time for students: everyday
E-mail:malamido@chem.auth.gr

Assistant personnel: One (1) Laboratory Assistant.

Aims of the course: The study of the basic principles of modern Organic Chemistry and the understanding of their importance/significance on the structure and reactivity of molecules as well as their interaction. Therefore the course covers the general principles of Organic Chemistry coupled with

the spectroscopic methods and the chemistry of alkanes, alkenes, alkynes, alkyl halides and aromatic compounds. In the Laboratory the tutoring covers experiments of principal laboratory techniques and simple organic reactions.

Skills: Familiarization with the basic principles of Organic Chemistry and application of experimental procedures in the laboratory.

Teaching methods: Lectures, tutoring and laboratory exercises and practices.

Contents of the course: Study and investigation of the basic principles of Organic Chemistry including spectroscopic methods. Study of some classes of organic compounds. The aforementioned subjects can be classified in the following chapters:
Structure and bonding
Bonding and molecular properties.
The nature of organic compounds: alkanes and cycloalkanes
Stereochemistry of alkanes and cycloalkanes
Overview of organic reactions (review)
Alkenes: structure and reactivity
Alkenes: reactivity and synthesis
Alkynes
Stereochemistry
Alkyl halides. Reactions: nucleophillic substitutions and eliminations
Structure elucidation: mass spectrometry and infrared spectroscopy
Structure elucidation: nuclear magnetic resonance spectroscopy
Conjugated dienes and ultraviolet spectroscopy
Benzene and aromaticity
Chemistry of benzene: aromatic electrophillic substitution
Organic reactions: a brief review

Suggested Literature:
- «ΟΡΓΑΝΙΚΗ ΧΗΜΕΙΑ ΤΟΜΟΣ Ι», J. McMurry, Πανεπιστημιακές Εκδόσεις Κρήτης, Ηράκλειο Κρήτης, 2007.
- «ΜΑΘΗΜΑΤΑ ΟΡΓΑΝΙΚΗΣ ΧΗΜΕΙΑΣ ΜΕΡΟΣ ΠΡΩΤΟ», Δ. Ν. Νικολαΐδης, Εκδόσεις Ζήτη, Θεσσαλονίκη 1987.

- «ΟΡΓΑΝΙΚΗ ΧΗΜΕΙΑ», Ν. Ε. Αλεξάνδρου-Α. Γ. Βάρβογλη, Εκδόσεις Ζήτη, Θεσσαλονίκη, 1986.

- «ORGANIC CHEMISTRY, Fourth Edition», T. W. Graham Solomons, John Wiley & Sons, New York, 1988.

- «ORGANIC CHEMISTRY, STRUCTURE AND FUNCTION, Sixth Edition», K. P. C. Vollhardt, W. H. Freeman and Company, New York, 2010.

- «ORGANIC CHEMISTRY", H. Beyer and W. Walter, Translator and Editor D. Lloyd, Albion Chemical Science Series, Chichester, England, 1997.

- «ADVANCED ORGANIC CHEMISTRY, Reactions, Mechanisms, and Structure, Fourth Edition», J. March, Wiley-Interscience Publication, John Wiley & Sons Inc., New York, 1992.

Educational activities:
Lectures, laboratory exercises, discussion with the students in every lecture.

Evaluation process:
Written examination at the end of the semester covering the knowledge of the students and their ability of critically evaluating different problems of Organic Chemistry. All examined subjects are graded equally. The duration of the examinations is 3 hours.
Additional, tests at the end of the Laboratory session (prerequisites for the completion of the lab and the acquisition of the corresponding mark/seal/stamp).

Use of ΤΠΕ / electronic distribution of the lectures:
Lectures and tutorials are based on Power point presentation or overhead transparent-film presentation.
The lectures are available online on the corresponding tutors' site at www.chem.auth.gr.

Teaching (lectures, tutorials, supervisions)
Teaching of this course is accomplished through lectures and supervisions. Teaching in the Laboratory is accomplished through lectures.

α) Lectures . The lectures (4 hours per week) are taking place in lecture room A on the ground level, of the Old Chemistry Building.
The lectures are available online on the corresponding tutors' site at www.chem.auth.gr

Lecture	Title	Tutor
1-2	Structure and bonding in organic compounds	**K. Litinas**
3-5	Bonding and properties of the molecules. Inductive and Resonance effects	**K. Litinas**
6-9	Alkanes and Cycloalkanes. Nomenclature of organic compounds. Intermolecular forces	**K. Litinas**
10-11	Stereochemistry of alkanes and cycloalkanes	**K. Litinas**
12	Organic reactions (general review)	**K. Litinas**
13-14	Alkenes (structure and reactivity)	**K. Litinas**

15-18	Alkenes (synthesis and reactions)	**K. Litinas**
19-22	Alkynes (derivatives from acetylene)	**K. Litinas**
21-23	Stereochemistry: Enantiomers, optical activity, *R,S*-isomers, diastereoisomers, meso compounds, Fieser projections, racemic isomers, asymmetric synthesis.	**E. Malamidou-Xenikaki**
24-27	Haloalkanes: Naming, structure, preparations, radical halogenations, Grignard reagents, reactions with organometalic compounds. S_N1, S_N2, E1, E2 reactions.	**E. Malamidou-Xenikaki**
28	Mass spectrometry: General, interpretation of mass spectra, fragmentation patterns.	**E. Malamidou-Xenikaki**
29-31	IR spectroscopy: General,interpretation of IR spectra, spectra of organic compounds.	**E. Malamidou-Xenikaki**
32-35	NMR spectroscopy: ^{1}H NMR spectroscopy, chemical shift, spin-spin coupling, ^{13}C NMR spectroscopy, use of NMR in resolution of molecular structure (analysis).	**E. Malamidou-Xenikaki**
36-37	Conjugated dienes: Preparations, stability, electrophilic additions, polymers, Diels-Alder reaction. UV spectroscopy.	**E. Malamidou-Xenikaki**
38-40	Aromatic compounds: Naming,structure and stability of benzene, Hückel's rule, aromatic ions, hetecyclic and polycyclic aromatic compounds, aromatic electrophilic substitution, oxidation and reduction of aromatic compounds, synthesis of substituted benzenes.	**E. Malamidou-Xenikaki**

b) Laboratory

LAB	**Title**	**Tutors**
1 (4 hours)	Safety rules in Chemical Laboratory	**E. Varella, K. Litinas, A.Maroulis**
2 (4 hours)	Distillation of water. Measurement of boiling point.	**E. Varella, K. Litinas, A.Maroulis**
3 (4 hours)	Hydrolysis of methyl benzoate. Recrystallisation of benzoic acid. Measurement of melting point.	**E. Varella, K. Litinas, A.Maroulis**
4 (4 hours)	Esterification of benzoic acid. Fractional distillation of product ester.	**E. Varella, K. Litinas, A.Maroulis**

5 (4 hours)	Nitration of methyl benzoate.	**E. Varella, K. Litinas, A.Maroulis**
6 (8 hours)	Caffeine extraction from tee lieves.	**E. Varella, K. Litinas, A.Maroulis**
7 (4 hours)	Chromatography (Column and TLC)	**E. Varella, K. Litinas, A.Maroulis**
8 (2 hours)	Test (written)	**E. Varella, K. Litinas, A.Maroulis**

CELL BIOLOGY

Code number: 9

Cycle:
Undergraduate

Semester:
2nd semester

Course type

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS):
6

Lectures (hours/week):
3
Tutorial (hours/week):
2
Laboratory work (hours/week):
-
Course coordinator:
Christos Panagiotidis, Professor

Tutor (s):
Christos Panagiotidis, Professor
Office : Room 315, 3rd floor Biology /Pharmacy Building
Student hours : 11-12 a.m. weekdays
Communication: by Email (pchristo@pharm.auth.gr)

Assisting personnel:
-

Aims of the course:

To help the students understand the basic principles of cell biology, the importance of the cell structure to its functions and the roles of both the subcellular organelles and the major biological macromolecules. To achieve these goals, the course presents various areas of cell biology, i.e. starting with the presentation of the chemistry of the cells and the biosynthesis of its macromolecules (DNA, RNA, proteins etc) and continuing into the structure of the membranous cell organelles, the pathways of intracellular transport, energy production and cell communication. Special emphasis will be given in aspects that are useful to pharmacy students, e.g. the cellular and molecular basis of disease and drug effects on the cell structure and function.

Skills: Familiarization with key concepts of cell biology.

Teaching methods:

Course lectures and tutorials.

Contents of the course:

Introduction to the Cell: Life and its study. Introduction to the cell and its components. Cell theory. Observing cells under a microscope. Similarities and differences between cells.

The chemical composition of the cells: Chemical bonds. Characteristics and the role of water. The molecules of the cell. Structures of simple sugars, polysaccharides, fatty acids/fats/lipids, nucleic acids and proteins. Enzymes, enzymatic reactions, allosteric motor proteins and protein machines.

Biological membranes, Intracellular compartments and transport: The lipid bilayer, membrane proteins (categories of membrane proteins, modes of attachment to the membranes, functions, the role of the cell cortex). Membranes carbohydrates and the importance of glycocalyx. Membrane organelles-structure and biological roles. Mechanisms of protein sorting and import to organelles (co- & post-translational translocation, the role and significance of signal sequences). The role of molecular chaperones in the protein transport across membranes, as well as on protein quality control. Vesicular transport (cargo selection, vesicle budding, targeting and docking of transport vesicles). Secretory pathway and the role of the Golgi apparatus. Endocytosis, phagocytosis and structure and functions of lysosomes.

Cytoskeleton: The role(s) of cytoskeleton. Intermediate filaments. Microtubules and biological importance of their dynamic instability. The microtubules as highways for the transport of vesicles and other cell components. Microtubule motor proteins and their importance. Structure and function of actin in cell structure and movement. Attachment to motor proteins and myosins.

Mitochondria and Chloroplasts, the energy centers of the eukaryotic cells: Biological oxidations and energy production. The mitochondrion and its morphology. Degradation and oxidation of macromolecules. Respiratory chain and chemiosmotic conversion of oxidation energy to ATP. Chloroplasts and plastid morphology. Biological significance of the chloroplasts-Photosynthesis. Mitochondrial and plastid biogenesis and genome.

Protein synthesis, folding, modifications and degradation: The genetic code; codons, anticodons & transport RNAs; Reading frames in translation; Ribosome, the place of mRNA decoding; The process of translation and its regulation; Post-translational protein modifications, protein folding and degradation. The roles of molecular chaperones in protein folding, transport and sorting. Protein degradation.

Organization, storage and reproduction of the genetic information: The genetic information resides in DNA; DNA and genetic code; DNA structure and organization. Eukaryotic chromatin structure: euchromatin, heterochromatin and their significance. Nucleosomes (structure and importance); Higher levels of chromatin organization-chromosomes; DNA replication: mechanism and enzymes involved in the process; The problem of replication at the ends and the role of telomerase. DNA damage, mutations and DNA repair mechanisms.

Transmission of the Genetic Information: The process of transcription, RNA polymerases and their functions; promoters and transcription initiation, general and regulatory transcription factors; the roles of chromatin and of the histone modifications on transcription; the role of DNA methylation and chromatin structure in heritable gene silencing; Post-transcriptional maturation of eukaryotic RNAs (cap addition, splicing and 3' end maturation).

Cell cycle and Cell Death: The stages of the cell cycle; Cell cycle regulation (the importance of checkpoints, cyclins and cyclin-dependent kinases); Stages of mitosis; The role of cytoskeleton in mitosis; Meiosis and sexual reproduction; Programmed cell death and its biological significance; Structural and functional of the cells undergoing programmed cell death; death signals; the roles and regulation of caspase activity; the role of mitochondria; anti-apoptotic factors.

Multicellular Organization and Cancer: Extracellular matrix and connective tissue; epithelium and intercellular junctions; Tissue maintenance and renewal-Deregulation in Cancer; Molecular roles oncogenes anti-oncogenes.

Proposed literature:

1. Alberts B.,Bray D.,Hopkin K.,Johnson A.,Lewis J.,Raff M.,Roberts K.,Walter P. "Essential Cell Biology", 2nd edition, 2006 (Greek translation, Publisher: Iatrikes Ekdoseis P.C. Pashalidis).
2. V. Marmaras & M. Lambropoulou-Marmara, "Biologia Kyttarou (Cell Biology)", Edition: 5/2005, Publisher: TYPORAMA.

3. Geoffrey M. Cooper & Robert E. Hausman "Cell: A Molecular Approach", 5th edition 2011, Publisher: Akadimaikes Ekdoseis I. Basdra & Co.

Educational activities:

Attendance of course lectures and tutorials.

Evaluation process and methods:

Intermediate exams (A) or final exams at semester end (B).
The exam structure is similar both in A & B and it consists of 20 questions where the students are asked to define whether the question is correct or wrong (0.1 point per correct answer, -0.1 point per mistaken answer) and to justify their answer (0.4 points per question). All questions are equivalent (0.5 points). Questions that have not been answered correctly by any students are withdrawn and final grade is calculated based on the grades from the remaining questions.
The examination time in 1 hour

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

ICTs are used both in the lectures and the tutorials of the course (PowerPoint and video presentations, interactive tutorials using computer simulations, etc.).

The course lectures, announcements, exam results etc. are regularly posted in the webpage of the course coordinator.

Teaching:

Teaching takes place with course lectures and tutorials.

A) **Lectures**.

Lecture	Title	Tutor
1	Introduction to the cell and its constituents	C. Panagiotidis
2	The chemical composition of the cells	C. Panagiotidis
3	Protein structure and function(s)	C. Panagiotidis
4-6	Biological membranes, Intracellular compartments and protein sorting	C. Panagiotidis

7-8	Vesicular transport, secretion, endocytosis, lysosomes and autophagy	C. Panagiotidis
9-10	Mitochondria and Chroloplasts – The energy centers of the eukaryotic cells	C. Panagiotidis
11-12	Protein synthesis, folding, modifications and degradation	C. Panagiotidis
13-14	Cytoskeleton	C. Panagiotidis
15	Structure and organization of the genetic material	C. Panagiotidis
16	DNA replication and DNA repair	C. Panagiotidis
17	The process of transcription and its regulation	C. Panagiotidis
18-20	Cell division and Programmed Cell Death	C. Panagiotidis
21	Meiosis and sexual reproduction	C. Panagiotidis
22-23	Multicellular organization and cancer	C. Panagiotidis
24-26	Review lectures	C. Panagiotidis

B) **Tutorials**

Tutorial	**Title**	**Tutor**
1	The chemistry of the cells – Properties and activities of enzymes – Enzyme inhibitors and pharmaceutical applications (Interactive).	C. Panagiotidis
2	The flow of genetic information and the enzymes involved in these processes (Interactive)	C. Panagiotidis
3	The cell in motion 1 – Cell division The cell in motion 2 – Chemotaxis, cell signalling, cell death and phagocytosis	C. Panagiotidis

BOTANY

Code of the course: 7
Level of studies: Undergraduate
Semester: 2nd
Type of the course: Basic knowledge
ECTS: 4
Oral courses: 2 h per week
Practicals: 2 h per week
Coordinator of the course: Kokkini Stella, Professor

Teaching staff:
Stella Kokkini, Professor
Room 8.23, 8th floor Building of Biology/Pharmacy School
Student interview: Wednesday and Friday 12.00 – 14.00
e-mail: kokkini@bio.auth.gr

Michael Moustakas, Associate Professor
Room 9.18, 9th floor Building of Biology/Pharmacy School
Student interview: Every day 12.00-14.00
e-mail: moustak@bio.auth.gr

Regina Karousou, Assistant Professor
Room 8.13, 8th floor Building of Biology/Pharmacy School
Student interview: Every day 11.00-12.00
e-mail: karousou@bio.auth.gr

Paraskevi Malea, Assistant Professor
Room 9.15, 9th floor Building of Biology/Pharmacy School
Student interview: Every day 9.00-12.00
e-mail: malea@bio.auth.gr

Effie Hanlidou, Lecturer
Room 8.13, 8th floor Building of Biology/Pharmacy School
Student interview: Tuesday 15.00-17.00, Thursday 11.00-13.00
e-mail: chanlidu@bio.auth.gr

Sofia Lavrentiadou
Room 8.15, 8th floor Building of Biology/Pharmacy School
Student interview: Monday 10.00-14.00
e-mail: xaroula@bio.auth.gr

Cognitive:

Acquaintance of students with basic knowledge of plant biology: morphology, anatomy and basic function (cellular and subcellular) of plants. Main principles of plant classification. Understanding and use of scientific names. Distinction of the natural groups of medicinal plants (plants with biologically active agents), based on their morphological and chemical diagnostic features.

Skills:
Use of the light microscope for observing and identifying plant cells, tissues and organs. Acquisition of skills in hand-preparing microscopic slides of plant material and interpretation of the observed image. Use of stereoscope for observation of macroscopic features that distinguish the major families of medicinal plants. Collection, taxonomic identification and preservation of plant specimens.

Teaching Methods:
Teaching includes hall lectures, laboratory work and fieldwork, in small groups of students.

Course Contents:
Part A: Introduction to Plant Biology. Origin, evolution and chemical composition of plants and the uses of plants by people (nutrition, energy, medicine). The typical plant cell. Subcellular organelles and structures with emphasis on cell wall, vacuoles and plastids. The plant tissues: meristems, epidermis, periderm, parenchyma, supporting, vascular tissues and special emphasis on secretory tissues. Organization of the plant body. The stem: morphology, primary and secondary structure, modifications. The leaf: morphology, structure, growth and modifications. The root: morphology, primary and secondary structure, modifications. The flower: morphology, development, structure, pollination and fertilization. The fruit: types, development, structure. The seed: morphology, structure, formation of the embryo and endosperm, seed dispersal and germination.
Part B: Historical overview of the use of medicinal plants in relation to their classification. Basic principles of scientific nomenclature and classification of plants. The "box-within-a box 'method of classification. The species as a basic taxonomic unit. The distinction of plants into Divisions. The three Subdivions of Spermatophyta. The classes and subclasses of Magnoliophytina (Angiosperms). Diagnostic morphological features of the main families of medicinal plants. Representative species of medicinal plants, their biologically active ingredients and pharmaceutical uses.

Recommended Bibliography:
Part A.
1. Morphology and Plant Anatomy
Edition: 015/1994
Author: Stylianos G. Delivopoulos

ISBN: 960-317-015-1
Copyright: A. Simoni

2. Botany. Morphology and Anatomy of Plants
Edition: 2011
Author: Artemios Bosabalidis
ISBN: 978-960-12-2047-5
Copyright: University Studio Press

Part B.
1. Systematic Botany: Phylogenetic-Phenetic Approach to Classification of Plant Organisms
Edition: 1/2004
Authors: BABALONAS D., S. KOKKINI
ISBN: 960-86090-3-8
Copyright: Charalampos NIK. AIVAZIS

Learning Activities:
Attending lectures, lab and field practice. Creation of a personal collection of dried plant specimens.

Assessment Methods:

Part A. Written examination (80%), laboratory exams (20%). Written exams are based on both multiple choice questions and critical thinking questions.

Part B. Five questions, graded according to their difficulty. The form of questions in PART B is found on the website of the Department of Pharmacy. Oral exams, based on the dried plant specimen collection created by each student (10% of final grade). They are conducted within the examination periods, before the written exams. The exact date and time are announced on the website of the Department of Pharmacy.

α) Lectures: 26 lectures (13 weeks X 2 hours) in classroom I1 by the use of data projector.

1-2	Introduction to plant biology. The typical plant cell.	M. Moustakas
3-4	Characteristics of the plant cell with empasis on vacuoles, cell walls and plastids.	M. Moustakas

5-6	Meristems and tissues. Dermal and Ground tissues.	P. Malea
7-8	Supporting and vascular tissues.	P. Malea
9-10	The plant organs. The stem: morphology, primary and secondary structure, modifications.	P. Malea
11-12	The leaf: morphology, structure, growth and modifications. The root: morphology, primary and secondary structure, modifications.	M. Moustakas
13 **14**	The flower: morphology, development, structure, pollination and fertilization. The fruit: types, development, structure. The seed: morphology, structure, formation of the embryo and endosperm, seed dispersal and germination. The medicinal plants (herbal medicines) and their therapeutic properties: From the tradition to the science	P. Malea S. Kokkini
15-16	The scientific basis of Systematic Botany - Taxonomic hierarchy - Taxonomic nomenclature	S. Kokkini
17-18	Division Spermatophyta-Families of the Subdivision Coniferophytina and Magnoliophytina. I. Class Magnoliatae, subclasses Magnoliidae-Hamamelididae	E. Hanlidou
19-20	Class Magnoliatae – Families of the Subclass Rosidae	R. Karousou

21	Class Magnoliatae – Families of the Subclass Dilleniidae and Caryophyllidae	E. Hanlidou
22	Class Magnoliatae – Families of the Subclass Asteridae	R. Karousou
23-24	II. Class Liliatae – Families of the Subclass Liliidae	E. Hanlidou
25-26	An overall view of the main families of medicinal plants of the Greek flora. Questions for the written exams of the course.	S. Kokkini

b) Laboratory exercises: Laboratory exercises in small groups, once a week for each group, in rooms M3 and M4 on the 5th floor Building of Biology/Pharmacy School. Use of light microscopes and stereoscopes. Students are required to attend all laboratory exercises (two hours/week).

Lab exercise	**Title**	**Lecturers**
1	Introduction. Use of light microscope. Form and size of plant cells. Nucleus, plastids and vacuoles.	M. Moustakas P. Malea
2	Starch grains, protein grains and crystals. Cell wall.	M. Moustakas P. Malea
3	Epidermis, stomata, trichomes. Periderm.	M. Moustakas P. Malea
4	Parenchyma, collenchyma, sclerenchyma. Vascular tissue, cambium. Secretory tissue.	M. Moustakas P. Malea
5	The stem: morphology, primary and secondary structure.	M. Moustakas P. Malea

6	The leaf: morphology and structure. The root: morphology, primary and secondary structure.	M. Moustakas P. Malea
7	Instructions for collecting plants and **c**reate a personal collection of dried plant specimens.	E. Hanlidou S. Lavrentiadou
8	How to identify families of Spermatophyta: Rosaceae, Fabaceae,Geraniaceae, Apiaceae, Brassicaceae, Malvaceae	E. Hanlidou S. Lavrentiadou
9	How to identify families of Spermatophyta: Solanaceae, Oleaceae, Lamiaceae, Cichoriaceae, Asteraceae, Poaceae	E. Hanlidou S. Lavrentiadou
10	Collection of plants (field work)	E. Hanlidou S. Lavrentiadou
11	Oral presentation of each student collection of plants	E. Hanlidou R. Karousou S. Lavrentiadou

MICROBIOLOGY-IMMUNOLOGY

Lesson code: NP26

Lesson level: undergraduate level

Studies semester: second

Lesson type:

X	General-background knowledge
	Scientific area (pharmaceutical)

Educational credits: 3

Lectures (hours): 2/week

Practical sessions (hours): 2/week in separate groups

Lesson coordinator: Nicolaos Malissiovas, professor

Tutors:

1) Nicolaos Malissiovas, professor, tel.: 2310 999177
2) Evdoxia Diza-Mataftsi, professor, tel.: 2310 999108
3) Anna Papa-Konidari, assosiate professor, tel.: 2310 999151
4) Maria Exintari, assistant professor, tel.: 2310 999031
5) Timoleon-Achilleas Vyzantiadis, assistant professor, tel.: 2310 999027
5) Georgia Gioula, assistant professor, tel.: 2310 999121
6) Lemonia Skoura, assistant professor, tel.: 2310 999156
7) Aggeliki Melidou, lecturer, tel.: 2310 999103
8) Dimitrios Chatzidimitriou, scientific fellow, tel.: 2310 999093
9) Melania Kachrimanidou, scientific fellow, tel.: 2310 999061

Assisting personnel (technical and laboratory):

Maria Zaikou-Tsakiropoulou, tel.: 2310 999114
Sofia Kotsinou, tel.: 2310 999091

Place:

The 1ST Department of Microbiology is located at the ground floor and the third floor of the Medical School building, in the main University Campus. All tutors and assisting personnel are present in their work places on a daily schedule.

Educational targets:

The targets of the lesson are to obtain a general approach and understanding on the fields of microbiology and immunology, as well as the learning of some of the more important bacteria, viruses and fungi that are responsible for infections in humans. Also, to learn about the diseases that these pathogens are able to cause, the available specific laboratory diagnosis and the necessary therapeutic approach.

Educational skills:

The familiarization with the concepts of the microbial invasion, the host defense, the laboratory diagnosis and the prevention and treatment of the infections.

Educational methods:

Amphitheatre lectures and practical laboratory sessions.

Lesson syllabus:

General microbial (bacteria, viruses, fungi, parasites) characteristics. Microbial physiological and chemical properties. Natural and chemical factors that act against microbes, antibiotics, antiviral and antifungal drugs. Basic concepts of immunology, relations between microbial and host organism. Ways of eliminating germs and how to be protected from them. Basic knowledge on. pathogenesis, clinical manifestation, laboratory diagnosis, prevention and treatment of specific pathogenic microbes.

Educational (student) activities:

Attendance of lectures in the amphitheatre and practical sessions.

Evaluation methods and procedure:

Written exams based on essay questions at the end of the semester. Only the students that have followed all compulsory (each session is of 2 hours) practical sessions have the right to participate. Exams are organized according to the schedule and in places announced by the Department.

Use of computerized-electronic means:

All lessons are done by the use of an electronic presentation format (PowerPoint).

Tutorial (Lectures/Practical sessions):

The teaching comprises lectures and practical/laboratory sessions.

a) Lectures: One hour lectures are given twice a week, usually at the "Megalo Amphitheatro" of the Medical School and are indicatively as following:

1. Bacterial characteristics, N. Malissiovas
2. General viral characteristics, M. Exintari
3. Fungal characteristics-opportunistic mycoses, T. A. Vyzantiadis
4. General parasitic characteristics, N. Malissiovas
5. Host protective answers, E. Diza
6. Cellular immunity, L. Skoura
7. Humoral immunity, G. Gioula
8. Immunological disturbances, G. Gioula
9. Natural flora, D. Chatzidimitriou
10. Pathogenetic mechanisms of microbial infections, T. A. Vyzantiadis
11. Sterilization, disinfection, antisepsis, A. Melidou
12. Antimicrobial drugs, sensitivity testing, A. Papa
13. Vaccines, M. Exintari
14. Tetanus, D. Chatzidimitriou
15. *Enterobacteriaceae*, M. Exintari
16. *Staphylococcus-Streptococcus*, M. Kachrimanidou
17. Gram (-) cocci, M. Kachrimanidou
18. *Herpesviridae* group, M. Exintari
19. *Retroviridae*, L. Skoura
20. Hepatitis, D. Chatzidimitriou
21. Measles-Mumps-Rubella, G. Gioula
22. *Influenza* virus, A. Melidou
23. *Mycobacteria*, M. Exintari
24. *Corynobacterium*, *Bordetella*, G. Gioula
25. Superficial mycoses, T. A. Vyzantiadis
26. Laboratory diagnosis of microbial infections. Questions-Explanations,

T. A. Vyzantiadis

b) Practical-laboratory sessions: Students attend in groups, once a week, in the same group, the same hour, for two weeks, with compulsory presence. The courses take part at the practical session room of the 1st Department of Microbiology.
Tutor: T. A. Vyzantiadis

References

1. P.R. Murrey, K.S. Rosenthal and M.A. Pfaller, Medical Microbiology, Scientific Editions Parisianou S. A., Athens, 2008.
2. J. K. Papapanagiotou, V. Kiriazopoulou-Dalaina, Introduction in Medical Microbiology, Virology and Immunology, University Studio Press, Thessaloniki 2005.
3. J. K. Papapanagiotou, V. Kiriazopoulou-Dalaina, Medical Microbiology & Virology, University Studio Press, Thessaloniki 2004.
4. All the topics, as they are presented at the relevant lectures and practical courses.
5. Relevant books and scientific journals that can be found in the Department. Reference sources from the University and Hospital Libraries or the Internet.

PHYSICAL CHEMISTRY

Code number: 11

Cycle: Undergraduate

Semester: 2nd

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 6

Lectures (hours/week): 3

Tutorial (hours/week):

Laboratory work (hours/week): 2

Course coordinator: Antonis Avranas (Assoc. Prof.)

Tutor (s):

1) Achilleas Papoutsis - Assoc. Prof.
Laboratory of Physical Chemistry
Department of Chemistry
Tel: 2310997755, e-mail: achille@chem.auth.gr

2) Antonis Avranas - Assoc. Prof.
Laboratory of Physical Chemistry
Department of Chemistry
Tel: 2310997686, e-mail: avranas@chem.auth.gr

3) Sotiris Sotiropoulos - Assoc. Prof.
Laboratory of Physical Chemistry
Department of Chemistry

Tel: 2310997742, e-mail: eczss@chem.auth.gr

4) Dimitris Tsiplakides - Assist. Prof.
Laboratory of Physical Chemistry
Department of Chemistry
Tel: 2310997766, e-mail: dtsiplak@chem.auth.gr

Assisting personnel: -

Aims of the course: a. Laboratory work. The students are familiarized with physicochemical measurements, e.g., titrations, acid-basic titrations, polarimetry, spectrophotometry, phase separation. They also learn to make plots and to present as reports their results.

b. Lectures. The students have to understand basic thermodynamics and use this knowledge to solve physicochemical problems.

The familiarization of the students with physicochemical phenomena, related to Pharmaceutical sciences (e.g., phase diagrams, distribution, extraction, ionic equilibrium, surface and interfacial phenomena, colloid systems, emulsions etc.)

The understanding of the basic concepts of rates of chemical reactions and of the rate laws, in order to be able to follow courses on pharmacokinetics.

To be able to solve simple physicochemical problems.

Skills: Familiarization with simple concepts of a part of physical chemistry, which is necessary for the students of pharmacy.

Teaching methods:

Lectures, (including solving problems as tutorials) and laboratory work.

Contents of the course:

Chemical thermodynamics What is thermodynamics. Definitions and basic concepts of thermodynamics. Thermodynamic system. Thermodynamic state. Equation of state of the ideal gases. Extensive and Intensive properties. Thermodynamic equilibrium. Theoretical base of thermodynamics. Temperature and zero law of thermodynamics. Internal energy, what is work, what is heat. The first law of thermodynamics. Enthalpy. Heat capacity. Molar heat capacity. Molar heat capacity of solids. Application of the first law in the ideal gases. Imperfect gases (real gases)- a new equation of state (Van der Waals equation). Relation of critical constants of gases and the constants of Van der Waals equation. The law of corresponding states. Evaporation and heat of evaporation. Trouton's rule.

Thermochemistry. The heat in the chemical reactions. Second law of thermodynamics. Entropy. Evaluating the Entropy. Gibbs function (free energy). Standard state. Chemical potential. Criteria of equilibrium and of spontaneous changes.

Phase equilibrium. The thermodynamic criterion of phase equilibrium, Gibbs phase rule and application in one-component system, The phase diagram of water, Phase diagrams, The liquid-vapor boundary in one-component system, Clausius-Clapeyron equation.

Chemical Equilibrium. Expressions of chemical (thermodynamic) equilibrium constant in i. Gas phase reactions, ii. Reactions in liquid mixtures or solutions iii. Reactions involving components in condensed or immiscible phases. Effect of temperature on equilibrium constant. Determination of reaction ΔH, ΔG, ΔS at constant temperature from the corresponding standard enthalpies and free energies of formation.

Reactions in Biological Systems and Bioenergetics. ATP as chemical energy carrier, Structure and properties of ATP, Standard energy of ATP hydrolysis, The role of ATP-ADP system, Reactions in biological system, Hydrolysis of peptide bond, Group transfer reactions, Enzymatic coupling of reactions, Synthesis and combustion of glucose.

Physical chemistry of mixtures. Gas-liquid solutions, Ideal-dilute solutions of miscible liquids, Deviations from Raoult's law, Mixtures of immiscible liquids, Distribution of a component between two immiscible liquids, Solute Extraction from a solution, Colligative properties.

Surface chemistry. Air/gas interface, Adsorption isotherms, Solid/liquid, Air/liquid, and Liquid/liquid interfaces, Surface and interfacial tension, Surface tension of solutions, Monomolecular films, Chromatography, Ion exchange.

Colloids. Introduction, Preparation purification and properties of colloids, 1. Kinetic properties of colloids, Diffusion, Sedimentation, Osmotic pressure, Donnan equilibrium, 2. Optical properties of colloids, Microscopic observation, 3. Electric properties of colloids, Isoelectric point, Stability of colloid systems, Emulsions.

Electrochemistry. **A.** Introduction, Electric conduction, Conductivity of electrolyte solutions, Applications of conductivity measurements, 1. Determination of solubility of (insoluble) salts, 2. Determination of pk of weak electrolytes – 3. Conductivity titrations.
B. Electrolytic dissociation, Arrhenius theory and deficiencies of the Arrhenius theory, Van't Hoff coefficient, dissociation, Ostwald dilution law, Activity and activity coefficient of ions, Ionic strength and Bjerrum coefficient, Debye Hückel limiting law.

C. Ionic equilibrium, Dissociation of water, Ionic equilibrium in acid and base solutions. Dissociation constant of acids and bases, Weak acid and base solutions, Indicators, Buffer solutions.
D. Galvanic cells, Electrode potential, Ag/AgCl electrode and calomel electrode.

The rate of chemical reactions. Introduction, Reaction rates, Rate laws and rate constants, Reaction order, Molarity of a reaction, Half-life of a reaction and time constants, Zero, first and second order of reactions, The temperature dependence of the rate law, Activated complex.

Proposed literature:

1. "Σημειώσεις Φυσικοχημείας για τους φοιτητές του Φαρμακευτικού Τμήματος", Α. Αβρανάς, Ι. Ζιώγας, Α. Παπουτσής, Σ. Σωτηρόπουλος (2005).
2. "Φυσικοχημεία" Τόμοι Ι, ΙΙ, ΙΙΙ, Atkins Πανεπιστημιακές εκδόσεις Κρήτης (2005).
3. "Atkin's Physical Chemistry", P. Atkins, J. de Paula, Oxford University Press (2006)
4. "Φυσικοχημεία" Γεωργίου Καραϊσκάκη Εκδ. Τραυλός & ΣΙΑ ΟΕ.
5. "Πειραματική Φυσική-Χημεία", Ι.Α.Μουμτζής, Εκδ. Ζήτη, Θεσσαλονίκη (2004).
6. "Φυσική Χημεία Ομογενών και Ετερογενών Συστημάτων", Δ.Α. Γιαννακουδάκης, Θεσσαλονίκη (1985-1986).
7. "Ηλεκτροχημεία", Ι.Α. Μουμτζής, Δ.Π. Σαζού, Θεσσαλονίκη (1992).

Educational activities:
Attendance of lectures and laboratory work.

Evaluation process and methods:
A. Laboratory work. After every laboratory work, the students give to the tutor a report. It contains a short theoretical part of the experiment and the experimental results with tables and/or figures. The marks of all reports are taken into consideration for the final written exams.
B. Lectures. Written exams at the end of the semester. The exams include theory and problems and exercises. The students that took part in the eight experiments, have given their reports, which had been accepted by the tutor, are able to participate in the exams. The examination time is 3 hours.

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

The lectures are made using PowerPoint and/or transparences.

The book "Σημειώσεις Φυσικοχημείας για τους φοιτητές του Φαρμακευτικού Τμήματος" ("Notes of Physical Chemistry for the students of Pharmacy"), A. Avranas, I. Ziogas, A. Papoutsis, S. Sotiropoulos (2005),

that contains theory and experiments, can be found in the website of the department of chemistry www.chem.auth.gr, laboratory of Physical chemistry (A. Avranas). At the same address, there is also additional information (S. Sotiropoulos, D. Tsiplakides).

Teaching:
Teaching consists of 36 lectures and 8 experiments in the lab.

A). Lectures. 3 times a week

Lecture	Title	Tutor
1-2	Introduction to basic concepts of thermodynamics	Papoutsis
3	Thermodynamic system, Equation of state of the ideal gases.	Papoutsis
4	Thermodynamic equilibrium	Papoutsis
5	Temperature, Zero law of thermodynamics	Papoutsis
6	Internal energy,Work, Heat	Papoutsis
7	The first law of thermodynamics	Papoutsis
9	Applications of the first law of thermodynamics in the ideal gases	Papoutsis
10	Real gases, a new equation of state	Papoutsis
11	Thermo chemistry, Applications (problems)	Papoutsis
12	Second law of thermodynamics, Entropy, Evaluating the entropy changes	Sotiropoulos
13	Thermodynamic properties, Criteria of equilibrium at various conditions	Sotiropoulos
14	Phase equilibrium, Gibbs phase rule, Clapeyron and Clausius-Clapeyron equations	Sotiropoulos
15	Chemical equilibrium, Effect of the temperature on equilibrium constant	Sotiropoulos
16	Methodology of finding thermodynamic data of reaction for various cases using bibliographic data of standard quantities	Sotiropoulos
17	Thermodynamic study of biochemical reactions	Sotiropoulos
18	Examples of exercises of phase and chemical equilibrium	Sotiropoulos
19-24	Physical chemistry of mixtures	Tsiplakides
25-26	Rate of chemical reactions, Zero-first and second order	Avranas
27	The temperature dependence of the rate law	Avranas

28	Rate of chemical reactions, Solved problems	Avranas
29-31	Surface Chemistry	Avranas
32-34	Colloids	Avranas
35-36	Electrochemistry, Applications	Avranas

B). **Laboratory work**

Laboratory	**Title**	**Tutor**
1	Acid-base titrations, Determination of the pK_a of a weak acid	All tutors
2	Conductivity, Determination of the critical micelle concentration of a surfactant	All tutors
3	Spectrophotometry, Rate of oxidation of KI from H_2O_2	All tutors
4	Polarimetry	All tutors
5	Solubility, ΔH of the solubility of $NaHCO_3$ in water	All tutors
6	Ternary systems, Preparing a ternary diagram	All tutors
7	Colloids, Evaluation of isoelectric point of albumin, Preparation flocculation and protection from flocculation of the hydrophobic colloid $Fe(OH)_3$	All tutors
8	Distribution, Determination of the distribution coefficient of I_2 between organic phase-water	All tutors

ENGLISH LANGUAGE B

Code number: NP-11

Cycle: undergraduate

Semester: 2nd

Course type

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 3

Lectures (hours/week): 3

Course coordinator:
Dr Smaragda Christidou-Kioseoglou

Tutor (s):
Dr Smaragda Christidou-Kioseoglou

Aims of the course:

Improvement of reading strategies, enrichment of vocabulary, understanding relations between the parts of a text through lexical cohesion devices.

Skills:

Understanding coherence and cohesion of the text and providing guided definitions of terms.

Teaching methods:

Interactive teaching

Contents of the course:

A. Pre-reading activities

Questions to predict the content of the text and activate existing knowledge.

B. Activities following skimming or scanning

General questions, questions for locating specific information, filling diagrams with the main titles of the text, checking the answers of the pre-reading questions.

C. Detailed-reading questions

True-False questions, matching side-titles with paragraphs, filling tables and diagrams.

D. Vocabulary learning activities

Guessing the meaning of unknown words from context, blank filling, matching terms with definitions, understanding the meaning of prefixes and unknown words, synonyms, antonyms, providing guided definitions of terms.

Proposed literature:
Ziaka, I. 2010. *English for Pharmaceutical Studies*, vol. I . Thessaloniki: University Studio Press.

Educational activities:
Attendance of lectures

Evaluation process and methods:
One final exam at the end of the semester

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

Power point presentations with interactive activities.
Supplementary teaching material is hosted on the Blackboard Platform e-courses, with open access.

Teaching:

A) **Lectures**.

Lecture	Title	Tutor
1	Drug resistance	S. Christidou-Kioseoglou
2	Acid-Base Chemistry	
3	General Principles of Catalysis	
4	Primary and Secondary Metabolism	
5	Toxicity	
6	Pharmacogenetics	
7	Toxicokinetic considerations	
8	Methods to reduce or Prevent Absorption	
9	Sibutramine	
10	Prescribing information	

11	Preparation of plant material	
12	Drugs derived from plants	
13	Nomenclature	

ENZYMOLOGY

Code number: NP29

Cycle: Undergraduate

Semester: 2nd semester

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 2

Lectures (hours/week): 2

Tutorial (hours/week): 1

Laboratory work (hours/week): 1

Course coordinator:
Anastasia Pantazaki, Assistant Professor

Tutor (s):

Dimitrios Kyriakidis, Professor

Office 504, 4th floor building Chemical
Cooperation with students: daily 11-12 a.m.
Contact: by email (kyr@chem.auth.gr)

Anastasia Pantazaki, Lecturer (Coordinator)

Office 511, 4th floor building Chemical
Cooperation with students: daily 11-12 a.m.
Contact: by email (natasa@chem.auth.gr)

Antonios Karagiorgas
(Laboratory, EEDIP)

Assisting personnel:
Asbesta Sophia, Zarifi Fotini

Aims of the course: The understanding of the basic principles of Enzymology and of the importance of the structure and function of enzymes and through these knowledge the understanding of Biochemistry.

Skills: Familiarity with basic concepts of Enzymology

Teaching methods:
Lectures at auditorium & laboratory/ exercises.

Contents of the course:

-History-the structure of enzymes

-Criteria for enzymatic reactions – determination of enzymes

-Choice of determination methods for enzyme-enzyme source Extraction of enzyme- Methods for enzyme purification.

-Designation and classification of enzymes.

-Mechanisms of enzyme reactions. REDOX-transfer reaction Reactions-hydrolysis Groups of reactions -Breaking ties with non-hydrolytic removal teams-isomerism-Synthetic Reactions.

-How enzymes work

-Impact of the concentration of the substrate-Michaelis Menten Equation

-The meaning of the constants Km and Vmax – Graphical determination of Km and Vmax-Influence of pH-temperature effects-Effects of concentration of the enzyme-Enzyme reactions with more than one substrates

-The active Centre-polar links-hydrogen-hydrophobic-links homeopolic links
-Competitive Blockers inhibition-non-competitive suspension-mixed suspension-Competitive inhibition-graphical representation of the kind of suspension-" " – suicide Inhibitors Actuators

Models-Model-Adair-MWC to KNF model-the General model-Negative synergy and reactivity of half-centers where isomerism enzyme-biological significance of the allosteric phenomena
.
-Stereo-selectivity of enzymes
-Limited proteolysis zymogen- Phosphorylation and dephosphorylation of enzymes – Other two-way homeopolic amendments to the structure of the enzyme except phosphorylation.

-Regulation of biosynthesis of enzymes in bacteria-regulation of biosynthesis enzymes in animal cells-biosynthesis of enzymes from Setting of substrates and metabolites-biosynthesis of enzymes regulate hormones.

-Enzymes in clinical chemistry

-Biotechnological applications of enzymes

Proposed literature:
1a. Enzymologia: I.c. Georgatsos-Mp Gioupsanis-D.A. Kyriakidis (Versions: Ziti), Thessaloniki, 2001.

1B. Laboratory Exercises: Enzymologia (versions: Ziti), Thessaloniki.
2. Enzymologia: i. Klonis (Agricultural University of Athens-Everything/Versions: Crete, Athens: ΄Embryo, 2007.

Educational activities:
Monitoring of lectures and laboratory/exercises

Evaluation process and methods:

Written examination at the end of the semester.

The assessment process is based on 8 questions where students are invited to respond. Open questions are equivalent. The examination time is 2.5 hours.

A) examinations at the end of the semeste, dates and places are announced by the Department.

The lectures and tutorials of this course are using ICT (Powerpoint presentation, frontistiriakes exercises, etc.).
The course lectures, announcements, rankings, etc. posted on the Bulletin Board of the laboratory of Biochemistry

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

Teaching:

The teaching of the course are lectures and laboratory exercises and supplementary lessons

A) **Lectures**. The lectures (1 hour) take place twice a week in the laboratory of Biochemistry Library, electronic media are used in the presentation of the lectures.

Lecture	Title	Tutor
1	History-name and classification of enzymes	D. Kyriakidis
2	The structure of enzymes-find the aminoic sequence of enzymes	D. Kyriakidis
3-4	Enzymatic reactions – Criteria of quantification Methods of enzymatic reactions	A. Pantazaki
5-6	Election method to determine the action of the enzyme-enzyme-source Extraction of enzyme-enzyme purification Methods-cleaning-automatic electrophoresis Protocol Species	A. Pantazaki
7-8	Protein-Purification of recombinant protein-Enzyme mechanics	A. Pantazaki
9-10	Enzyme reaction-Mechanisms of enzyme	D. Kyriakidis

	reactions. REDOX-transfer reaction Reactions-hydrolysis Reactions teams-Breaking ties with non-hydrolytic removal teams-isomerism-Synthetic Reactions.	
11-12	Nucleic acids metabolism Enzymes-Specific nucleases-Ligases- Helicases- Topoïsomerases-DNA-Polymerases telomerases Multiple forms of enzymes-Isoenzymes	A. Pantazaki
13-14	Kinetic enzymatic action-reaction of the concentration of the substrate-Michaelis-Menten Equation, the meaning of the constants Km and Vmax – Graphical determination of Km and Vmax-Influence of pH-temperature effects-Effects of concentration of the enzyme-Enzyme reactions with more than one substrates a. Pantazaki	A. Pantazaki
15-16	Active Centre. Polar links-hydrogen-Hydrophobic-links Homeopolic links Competitive-blockers inhibition-non-competitive suspension-suspension Joint suspension-Competitive-graphical representation of the kind of suspension-suicide Inhibitors Actuators	A. Pantazaki
17-18	17-18 To model phenomena-Allosteric Hill-model Adair-model MWC model-To-model KNF-General-Negative synergy and reactivity of half-centers Where isomerism enzyme-biological significance of allosteric phenomenal	A. Pantazaki
19-20	Stereo-selectivity enzymes-how enzymes operate	A. Pantazaki
21-22	Limited proteolysis zymogen- Phosphorylation and dephosphorylation enzymes – Other two-way homeoopolic amendments to the structure of the enzyme except phosphorylation	A. Pantazaki
23-24	Biosynthesis enzymes in Setting of bacteria-enzyme biosynthesis setting, in animal cells-biosynthesis enzymes from Setting of substrates and metabolites-biosynthesis enzymes regulate hormones.	A. Pantazaki
25-26	Enzymes in clinical chemistry Biotechnological applications of enzymes	A. Pantazaki

B) **Laboratory work**
Students are required to attend three supplementary lessons (1 hour).

Laboratory	**Title**	**Tutor**
1	Ways of solution the cells. brief introduction to the s. cerevisiae. Source selection criteria .Enzymic extraction buffer Properties. Protein extraction principles. Inbertasis cleaning process based on solubility at pH, ethanol, alatia.	A. Karagiorgas
2	The principle of the test method and Bradford Nelson. The importance of successive dilutions. .	A.Karagiorgas
3	The application of DEAE chromatography for purification of inbertasis	A. Karagiorgas
4	The kinetic and the purification Protocol of inbertasis	A.Karagiorgas

SEMESTER III

PHYSIOLOGY 1

Code number: NP30

Cycle: Undergraduate

Semester: 3rd

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): 2

Course coordinator: George Anogeianakis (Professor)

Tutor (s):

Georgios Anogeianakis) (Professor)

Cooperation with students: … ….
Contact: Tel. 2310 999054, email: anogian@auth.gr

2) D. Koutsonikolas (Associate Professor)

3) V. Stergiou-Michaelidou (Assistant professor)

Assisting personnel:

Aims of the course:

Knowledge of the physiological function of the circulatory, respiratory and urinary system of the human body

Skills:

Teaching methods:

All of the mechanisms of these systems in conjunction with basic anatomical concepts associated with the above functions. Laboratory exercises: their content refers to key sections of the above-mentioned systems. Use of Video projection and simulation programs to PCs. more detailed analysis on the targets of the course reported on the websites: http://www.experimentalphysiology.gr and http://physiology.med.auth.gr. At the end of the exercises examinations are carried.

Contents of the course: Cell and fluid homeostasis. Membrane transfer. Physiology of nerve and muscle stimulators. Heart and circulation, heart electro-physiology. Flow, pressure and resistance, the heart as a pump. The distal movement. Pneumonic ventilation, perfusion and diffusion of gases. Mechanics of breathing. Glomelular filtration and kidney clearance. Renal transport Mechanisms of concetrating and diluting of urine. Setting the volume and osmolarity of extracellular fluids. Setting the acid-base balance by the kidneys

Proposed literature:

Educational activities:

Lesson from the amphitheatre: learning the functioning of these systems in conjunction with basic anatomical concepts associated with the above functions. Laboratory exercises: the familiarization of students in methodology on issues contained in the material of the theoretical lesson.

Evaluation process and methods:

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

Teaching:

The teaching of the course are lectures and exercises.

B) **Lectures**.

CHEMISTRY OF ORGANIC COMPOUNDS

Code number: 22
Cycle: Undergraduate
Semester: 3rd

Course Type

X	Background / General Knowledge
	Scientific area: Pharmacy

Credit units (ECTS): 7
Lectures (hours per week): 3
Tutorial (hours):
Laboratory (hours per week): 2
Course coordinator: John K. Gallos

Διδάσκων: John K. Gallos
Office 301, 1st floor old chemistry building
Office hours: Monday to Friday 12.00-13.30
E-mail: igallos@chem.auth.gr

Assistant personnel: -

Aims of the course: Students should become familiar with the basic principles of modern organic chemistry and understand their value in the function and reactivity of biomolecules as well as their interaction with small molecules. To this end, the chemistry and properties of the basic classes of organic compounds and biomolecules will be examined and discussed.

Skills: Familiarization with the basic principles of Organic Chemistry.

Teaching methods: Lectures, tutoring and laboratory exercises and practices.

Contents of the course:
Interpretation of the fundamental properties of the major classes of organic compounds, a subject divided in the following chapters:

Alcohols and thiols
Ethers, epoxides and sulfides
Introduction to the chemistry of carbonyl compounds
Aldehydes and ketons: nucleophilic addition reactions
Carboxylic acids
Carboxylic acid derivatives and nucleophilic acyl substitution reactions
α-Substitution reactions of carbonyl compounds
Carbonyl condensation reactions
Aliphatic amines
Arylamines and phenols
Biomolecules: hydrocarbons
Biomolecules: amino acids, peptides and proteins
Biomolecules: lipids
Biomolecules: heterocyclic compounds and nucleic acids

Suggested Literature:

1. John McMurry, ΟΡΓΑΝΙΚΗ ΧΗΜΕΙΑ, Τόμοι Α΄ και Β΄, Πανεπιστημιακές Εκδόσεις Κρήτης
2. K. Peter C. Volhardt, Neil E. Schore "Organic Chemistry", Freeman & Company
3. Maitland Jones, Jr., "Organic Chemistry", Norton & Company
4. Robert T. Morrison, Robert N. Boyd, "Organic Chemistry", Prentice Hall
5. T. W. Graham Solomons, "Organic Chemistry", Wiley &Sons

Educational activities:
Lectures, laboratory exercises, discussion with the students in every lecture.

Evaluation process:
(A) Optional intermediate tests, and
(B) Written examination at the end of the semester covering the knowledge of the students and their ability of critically evaluating different problems of Organic Chemistry. All examined subjects are graded equally. The duration of the examinations is 3 hours.

Use ofΤΠΕ / electronic distribution of the lectures
Lectures and tutorials are based on Power point presentation. The lectures are available online on the corresponding tutors' site at www.chem.auth.gr.

Teaching (lectures, tutorials, supervisions)
Teaching of this course is accomplished through lectures and supervisions. Teaching in the Laboratory is accomplished through lectures.

A) Lectures.

The lectures (4 hours per week) are taking place in lecture room A on the ground level, of the Old Chemistry Building. The lectures are available online on the corresponding tutors' site at www.chem.auth.gr.

Lecture	Title	Teacher
1-2	Alcohols and thiols	J. K. Gallos
3-4	Ethers, epoxides and sulfides	J. K. Gallos
5	Introduction to the chemistry of carbonyl compounds	J. K. Gallos
6-10	Aldehydes and ketons: nucleophilic addition reactions	J. K. Gallos
11-12	Carboxylic acids	J. K. Gallos
13-16	Carboxylic acid derivatives and nucleophilic acyl substitution reactions	J. K. Gallos
17-18	α-Substitution reactions of carbonyl compounds	J. K. Gallos
19-21	Carbonyl condensation reactions	J. K. Gallos
22-23	Aliphatic amines	J. K. Gallos
24-25	Arylamines and phenols	J. K. Gallos
26-28	Biomolecules: hydrocarbons	J. K. Gallos
29-32	Biomolecules: amino acids, peptides and proteins	J. K. Gallos
33-34	Biomolecules: lipids	J. K. Gallos
35-36	Biomolecules: heterocyclic compounds and nucleic acids	J. K. Gallos

B) Tutorial
Ten (10) hours of the laboratory part of this course are used as tutorial hours (Tutor: J. K. Gallos).

C) Laboratory
1. Synthesis and purification of aspirine (3 hours)
3. Synthesis and purification of methyl benzoate. (8 hours)
4. Nitration and purification of methyl benzoate (4 hours)
5. Test (written) (1 hour)

BIOCHEMISTRY I

Code number:21

Cycle: Undergraduate

Semester: 3rd

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): 3

Course coordinator:
Giannakouros Thomas, Associate Professor

Tutor (s):

Giannakouros Thomas, Associate Professor

Office 501, Chemical building 4th floor
Cooperation with students: daily 11-12 a.m.
Contact: by email (giannako@chem.auth.gr)

Nikolakaki Eleni, Assistant Professor
Office 505, 4th floor building Chemical
Cooperation with students: daily 11-12 a.m.
Contact: by email (nikol@chem.auth.gr)

Theodore Sklaviadis, Professor

310 3rd floor office building Biology/Pharmacy
Cooperation with students: daily 11-12 a.m.
Contact: email sklaviad@pharm.auth.gr

Assisting personnel:

Papi Rigini

Antonis Karagiorgas
Sofia Rammoy-Asvesta (Assistant)

Aims of the course:

The understanding on the part of students, the structure of biological macromolecules, such as proteins, nucleic acids, carbohydrates and lipids. It also analyses the structure, classification, operating mechanism and specificity of enzymes, as well as the principles of biological oxidation that lead to production and save energy for living organisms.
During the courses are given useful examples for students of pharmacy on the effect of drugs that target specific bio-molecules.

Skills:

Familiarity with basic concepts of Biochemistry

Teaching methods:

Lectures, laboratory exercises

Contents of the course:
Introduction. Amino Acids. Structure and biological function of proteins. Catalytic proteins. Enzymes. Biologically important carbohydrate. Biologically important lipids. Nucleic acids structure. Biological oxidations.

Proposed literature:

1. Introduction to Biochemistry:J.C. Georgatsos (versions: Giachoydi) 6th Edition, Thessaloniki, 2005).

2. Biochemistry, volume i: Berg Tymoczko L.J., M.J., Stryer l. (A. Aletras, I.D. Balkana Drainas, H. Kouvelas, G.K. Papadopoulos, M. Franc-Lazaridi versions Uc), 2005.

3. Basic Biochemistry: K.a. Dimopoulos, p. Andonopoulou-Wilson (versions: Co-edition with P. Andonopoulou-Wilson-Provider-Publisher KONSTANTINOS A. DEMOPOULOS) 2nd edition, Athens 2009.

Educational activities:
Monitoring of lectures and laboratory exercises

Evaluation process and methods:
Written exams at the end of the semester, both in theoretical lessons and laboratories. The examinations take place at the end of the semester.

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

The lectures of the course presented using slides.
Announcements, rankings, etc. posted on the Bulletin Board of the laboratory of biochemistry.

Teaching:
(Lectures/Workshops/Tutorials)
The teaching of the course are lectures and laboratory exercises.

A) **Lecture**
B) The lectures (1 hour) take place twice a week

Lecture	Title	Tutor
1	Introduction to Biochemistry	E. Nikolakaki
2	Amino Acids	E. Nikolakaki
3	Properties of amino acids	E. Nikolakaki
4	Peptide bond in primary protein structure	E. Nikolakaki
5	Examples of formulae peptides	E. Nikolakaki

6	Higher protein configurations.	E. Nikolakaki
7	Fidelity-modulation Properties of proteins	E. Nikolakaki
8	Structural, functional, regulatory proteins	E. Nikolakaki
9	Defence mobility proteins	E. Nikolakaki
10	Storage, infectious protein-Denaturing proteins	E. Nikolakaki
11	Enzymes generally – Rank-Name	T. Sklaviadis
12	Cytochromes- Co-enzymes	T. Sklaviadis
13	Kinetic enzymatic reactions	T. Sklaviadis
14	Setting the action of enzymes	T. Sklaviadis
15	Inhibitors-Actuators- Stereoselectivity	T. Sklaviadis
16	Allosteric phenomenon-Isoenzymes	T. Sklaviadis
17	General biological oxidation	T. Giannakouros
18	Krebs Cycle-Cycle glyoxylic acid	T. Giannakouros
19	Respiratory chain	T. Giannakouros
20	Oxidative phosphorylation	T. Giannakouros

21	Generally on carbohydrates-Starch-Glycogen-Glycoproteins	T. Giannakouros
22	Generally on lipids, triglycerides-fatty acid-Phospholipid-Derived isoprene Membranes-Lipoproteins	T. Giannakouros
23	Structure of nucleic acids	T. Giannakouros
24	Properties of nucleic acids	T. Giannakouros

B) **Laboratory work**

Laboratory	**Title**	**Tutor**
1	Isolation,study and properties of osin	T. Giannakouros, Sofia Rammou-Asvesta, postgraduate students
2	Kinetic enzymatic reactions	T. Giannakouros, Antonis Karagiorgas, postgraduate

		students
3	REDOX enzymes	E. Nikolakaki, Antonis Karagiorgas, postgraduate students
4	Gene expression regulation in Escherichia coli (BL21)	E. Nikolakaki, Rigini Papi, postgraduate students

INORGANIC PHARMACEUTICAL CHEMISTRY

Code number: 20

Cycle: Undergraduate

Semester: 3rd

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 6

Lectures (hours/week): 2

Tutorial (hours):
-

Laboratory work (hours): 2

Course Coordinators: Athina Geronikaki, Dimitra Hadjipavlou-Litina

Tutors:
1) **Athina Geronikaki, Professor**
Room 414 & 411 ,4th floor Biology/Pharmacy building.
Collaboration with students : Every day
Communication: e-mail (geronik@pharm.auth.gr)

2) **Dimitra Hadjipavlou-Litina, Professor**
Room 408/B & 410, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 11-12.
Communication: e-mail (hadjipav@pharm.auth.gr)

Assisting personnel:
Dr. Antony Gavalas,

Aims of the course: Understanding by the students of inorganic drug, including chemical properties and biological role as well as of elements (metals and metalloids) involved in its structure and synthesis. Aims comprise knowledge and skill (capacity) of synthesis, qualitative control, characterization, quantitative control of pharmaceutical preparations which contain inorganic drugs, their mechanism of action at the molecular level as well as their use and side effects.

Scills: Familiarity with basic knowledge: a) biological activity of metals-metalloids b) biological activity of inorganic compounds of pharmaceutical interest, c) their interaction with biological targets and d) their characterization –qualitative/quantitative control.

Teaching methods:

Lectures and Laboratory work.

Contents of the course:

Inspection of elements in the groups of periodic table in respect with Chemistry-Pharmacological/Toxicological activity, biological activity of metals-metalloids, inorganic compounds of pharmaceutical interest: synthesis/origin , quality/quantity control, properties, uses, side effects and their chemical explanation.

Group I

Lithium. Lithium carbonate. Natrium (sodium), natrium carbonicum and bicarbonicum, natrium sulfuricum, natrium thiosulfatum, natrium citricum,natrium tetraboracium, natrium fluoratum, natrium chloratum, natrium phosphoricum bibasicum andbiphosphoricum.
Potassium. Kalium iodatum, kalium permanganicum,potassium chloride.

Group II

Αλκαλικές γαίες. Magnesium, magnesium oxydatum, magnesium carbonicum leve, magnesium sulfuricum, magnesium steaticum and trisylicicum, magnesium hydroxidatum , magma magnesiamagnesium chloratum.
Calcium. Calcium phosphoricum dibasicum, calcium phosphate,calcium chloride , calcium glyconicum, calcium sulfuricum, calcium hydroxidatum, calcium hydroxidatum solution, Calccium-Pharmacology.
Barium. Barium sulfuricum .

Group III

Borium. Acidum boricum.
Aluminium. Aluminium hydroxidatum, colloidale, aluminium hydroxidatum gelatum siccum, alumen.

Group IV
Carboneum, carboneum activate.
Silicium. Bentonitum, Kaolinum leve- Bolus-alba laevigata, talcum purificatum.
Pliumbum.
Group V
Nitrogenum. Oxydum nitrosum, ammonia concentrate,ammonium hydricum solutum, ammonium carbonicum,ammonium chloratum.
Arsenicum.Acidum arsenicum. Toxicity of arsenicum's compounds and their antidotes.
Stibium, Stibio-kalium tartaricum.
Bismuthum.
Group VI
Oxygenium. Aqua destilata.Hydrogenium peroxidatum.
Sulfur. Sulfur praecipitatum..
Group VII
Halogens.Acidum hydrochloricum, cxalcaria chlorata (calcium hypochlorosum.
Iodum. Tinctura iodi.
Magganium as trace element.
Sub-groip IB
Cuprum. Cuprum sulfuricum. Role of cuprum in organism. Cuprum sulfuricum.
Argentum. Argentum nitricum.Argentum compounds .
Sub-group IIB
Zincum.Zincum oxidatum. Zincum as trace element. Consequences of its deficient in organism.. Interaction of zincum with vitamines..
Hydrargirum. Hydrargyrum oxidatum flavum.Hydrargyrum bichloratum.Υδράργυρος. Hydrargirum cyanicum.
Group VIII
Ferrum. Ferrum as trace element. Ferrum glyconicum. Ferrum sulfuricum.
Also:
Tungsten, Thallium, Cadmium, Cobalt, Selenium, Vanadium, Nickel, Platinum and compounds in pharmaceutical use as drugs.

Proposed Literature:

1. Remingtons:Pharmaceutical Sciences 14 Ed.Mac.Publishing Co., Easton, 1970.
2. Roger's Inorganic Pharmaceutical Chemistry, 8th ed., by T.O.Soine and C.O.Wilson, Lea and Felinger, Filadelfia, 1967.

3. Bio-inorganic Chemistry R.W.Hay, editor Ellis Horwood (in Greek language by Ε. Μάνεση-Ζούπα & Δ. Ράπτη). Editor Papazisis, 1992
4. Bioinorganic Chemistry: Inorganic Elements in the Chemistry and Life. An Introduction and Guide. W. Kaim & B. Schwderski. Editor Wiley, 1994
5. National Formulary, National Drug Organization 2007

Educational activities:
Lectures and laboratory work.

Evaluation process and methods: Advance written exams (A), exams in the end of semester (B).
Examination is based on some questions which should be answered according to the obtained knowledge during semester as well as to the ability to combine knowledge with information and the critical thought of the students.
Exams in the end of semester take place on date and hours as well as in auditoriums announced by the Department.

Duration of exams is 3 h.

Marks are rotatable.

A) Advance examination
The right to participate in this examination is given to students of the 3d semester who have attended the lectures (3 among 6 lectures).
There are two examinations, one in the middle of the course and another to the end. Only students who have succeeded (mark 5 or higher) in the first examination can participate in the second. Students succeeded in this examination are relieved from the examination in the end of semester and the total mark is an average of two examinations.

During laboratory practice students present the composition of their results. At the end of laboratory practice students have a written examination. Success in laboratory practice (average of notebook and test should be 5 at least) is obliged for the participation in exams in the end of semester. The laboratory practice mark represents the 20% of the final mark.

Use of TIC / Electronic distribution of the lectures:

Tutors:

1) A. Geronikaki

Lectures are presented as Powerpoint.

2) Dimitra Hadjipavlou-Litina, professor
Lectures, notes, statements etc are presented in the corresponding place of the website of the School of Pharmacy.

Teaching:

α) Lectures. The lectures take place 1 hour twice per week Auditorium D12, in the building of the School of Natural Sciences.

Lecture	Title	Tutor
1	Quality and quantity control	A. Geronikaki
2-4	Group I.Introduction. Lithium, lithium carbonicum. Natrium and its compounds	A. Geronikaki
5	Compounds of sodium and potassium	A. Geronikaki
6	Groupα II.Introduction. Magnesium and its compounds	A. Geronikaki
7	Magnesium and its compounds. Calcium	A. Geronikaki
8	Compounds of calcium	A. Geronikaki
9	Compounds of calcium,its pharmacology. Barium. Barium sulfuricum.	A. Geronikaki
10	Group III. Borium and its compounds	A. Geronikaki
11	Group III. Aluminum and its compounds	A. Geronikaki
12	Aluminum and its compounds	A. Geronikaki
13	Group IV.Carboneum.Carboneum activate. Silicium	A. Geronikaki
14	Group IV.Bentonite, Kaolin and talcum. Pliumbum, its absorption, toxicity and therapy.	A. Geronikaki
15	Group V.Nutrogenum and its compounds	A. Geronikaki
16	Bismuthium. Group VI. Oxygenium	A. Geronikaki
17	Aqua destilata, hydrogenium peroxidatum υ	A. Geronikaki
18	Sulfur. Group VII. Halogens, fluoride as trace element , hydrochloric acid, , calcaria chlorata	A. Geronikaki
19	Iodine . Manganium	A. Geronikaki

20-21	Arsenic-Antinonium	D.Hadjipavlou-Litina
22	Tungsten, Thallium, Cadmium, Cobalt	D.Hadjipavlou-Litina
23-24	Selenium,Vanadium,Nickel,Platinum	D.Hadjipavlou-Litina
25-26	Copper, Mercury, Zinc	D.Hadjipavlou-Litina

B) Laboratory

Laboratory	**Title**	**Tutor**
1-3	Preparation of boric acid and calcium phosphoricum bibasicum. Praparation of original solutions	Geronikaki, Hadjipavlou-Litina, Gavalas
4-5	Quantitative determination of borax and boric acid	Geronikaki, Hadjipavlou-Litina, Gavalas
6-8	Quantitative determination of tincture iodine (I_2 + KI)	Geronikaki, Hadjipavlou-Litina, Gavalas
9	Quantitative determination of ferrum sulfuricum and potassium permanganicum	Geronikaki, Hadjipavlou-Litina, Gavalas
10	Quantitative determination of cuprum sulfuricum	Geronikaki, Hadjipavlou-Litina, Gavalas
11	Quantitative determination of magnesium sulfuricum	Geronikaki, Hadjipavlou-Litina, Gavalas
12	Quantitative determination of $KMnO_4$ by chromatometric method	Geronikaki, Hadjipavlou-Litina, Gavalas
13	Quantitative determination of sodium sulfuricum	Geronikaki, Hadjipavlou-Litina, Gavalas

Pharmaceutical Analysis I

Code number: 23

Cycle: Undergraduate

Semester: 3rd

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 7

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week):8

Course coordinator: John E. Koundourellis

Tutor (s): 1) John E. Koundourellis
Office 2nd floor, Pharmacy/Biology building ,
Coopreration with the students every day (if the tutor is available) 9:00 a.m.-3:00 p.m. e-mail: koundour@pharm.auth.gr / mobile phone 6944 67 71 35 / office telephone 2310 99 76 43/laboratory telephone 2310 99 76 67

2) Catherine K. Markopoulou
Office 2nd floor, Pharmacy/Biology building ,
Coopreration with the students Wednesday and Thursday 11:00 a.m.-1:00 p.m.

e-mail: amarkopo@pharm.auth.gr / office telephone 2310 99 76 65/laboratory telephone 2310 99 76 67

Aims of the course: The course enables students not only to identify medicines(active ingredients) but also to quantify them in their pure form, in pharmaceutical formulations and in biological liquids(active ingredients and metabolites) . Ultraviolet spectrophotometry is considered a very useful technique in Pharmaceutical Analysis because it is highly sensitive (due to electronic excitations-orbitals are involved in electronic transitions). Furthermore, identification of medicines is carried out on the basis of their various chromophore groups(the chromophore concept) because they provide (give) specific spectrum) which is characterized from its fine structure: **maxima, minima, diversions, shoulders**, **width of electronic excitations ,that is,width in the spectrum where the electronic promotions occur, values of specific absorption coefficient, A 1%, 1cm, ratios of absorption intensities in specific maxima, minima** or combination of them, pH solution etc). The method, because of the above mentioned advantages, can be combined with High-Performance Liquid Chromatography in order to detect, identify and quantify the medicines in the presence of the various impurities and metabolites. Ultraviolet spectrophotometry is described extensively in various Pharmacopoeias (Greek, European etc) as a useful means for the identification of drugs, their purity control and the quantitative determinations of various medicines in pharmaceutical formulations. Also, instrumentation is described.
This kind of knowledge is considered fundamental and essential for a possible future professional employment of a Pharmacy graduate in a Pharmaceutical Analysis Laboratory (in addition,the aim of the course is to make the student familiar with instrumentation: dispersive instruments-photomultiplier detectors-rapid scan ultraviolet/visible spectrometers-linear photodiode arrays –Fourier Transform ultraviolet/visible spectrophotometers etc.) and sampling .

Skills: To become acquainted with basic concepts of Pharmaceutical Analysis.

Teaching methods: Lectures and Laboratory practice. The laboratory practice has been enhanced so that students can be acquainted with and become more familiar with the spectra of the medicines and with the additional use of computers to make possible the supervised self-study, which is very useful for the training of the students.

Contents of the course: Principles of instrumental methods. Classification of instrumental analytical methods. General characteristics of instrumental methods that are used in Pharmaceutical Analysis. Energy and the electromagnetic spectrum. The nature of the radiated energy(ultraviolet/visible is a form of energy ,which can be described by two

complementary theories: the wave theory and the corpuscular theory. Neither of these theories alone can completely account for all the properties of light : some properties are best explained by the wave theory ,and others by the corpuscular theory.The wave theory supports the propagation of light by light waves involves both electric and magnetic forces). Interactions of electromagnetic radiation with matter. Classification of spectroscopic analytical techniques which can be applied in Pharmaceutical Analysis. Generally about spectroscopic methods. Ultraviolet spectrophotometry: Absorption and emission spectra. Principles ,applications and methods.
Study of ultraviolet spectrum of various representative organic molecules(called chromophores) which are of particular interest in Pharmaceutical Analysis (spectra of benzene ,aniline, pyridine ,phenol and diphenols ,barbituric acid and its derivatives ,xanthines, hormones ,corticosteroids (steroid enones),anti-inflammatory ,anti-histamine).
Quantifications through ultraviolet spectrophotometry: The Beer-Lambert Law.The importance of specific absorption coefficient in quantitative analysis. Spectophotometric quantifications of active ingredients in different formulations. Polar and non- polar solvents. Stock solutions and dilutions .Methods of extraction in Pharmaceutical Analysis (liquid-liquid and solid-phase extraction).Commonly used excipients in pharmaceutical formulations .Construction of calibration graph-Standard Addition Method. Instrumentation: the light sources, the monochromator ,the optics, diode array instruments ,instrument calibration, calibration of absorbance and wavelength scale .Determination of instrumental resolution and stray light. Difference spectrophotometry and derivative spectra
Flame spectrophotometry and spectrophotometry of individual absorption: flames, burners nebulisers. Transmission Flame spectrophotometry. Individual absorption spectrophotometry. Instrumentation, sensitivity and detection limit. Applications
Proposed literature:

Educational activities: Attendance of the module and the laboratories, handing in of laboratory notebook.
Evaluation process and methods: Once the laboratory course is successfully completed with a pass mark(passing grate) and the laboratory notebook is handed in corrected, each student with his/her team should hand in a project on an earlier assigned topic (the project is prepared individually with the responsibility of the student) -the project should be corrected-. At the end of the academic year, students have to undergo oral exams. After having completed the above mentioned obligations, students can participate in the written examinations of the pharmaceutical analysis modules. Cooperativeness, initiative and interpersonal relationship with the instructor plays an important role in the student assessment.

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures: The laboratory content of the module has been enriched with electronic educational material that is special software in CD-ROM format which contains the spectra of some representative medicines as well as their spatial configurations, that is, the chemical structure in space (bonds length, ring arrangement, various bonds angles) so that the relation of the structure of the medicine with the relevant spectrum to be obvious. Moreover, a large part of the laboratory practice is done by the students with the application of a special UVPC programme.
The lectures of the modules are enriched by multimedia use (power point presentations, videos etc).

Teaching:
The module is taught both through lectures and laboratory practice.

A) **Lectures**.
The lectures, which last for two hours, take place twice a week in Classroom D12 and multimedia are used to present the topics to be dealt with.

Lecture	Title	Tutor
1	Principles of Instrumental Pharmaceutical Analysis	John E. Koundourellis Catherine K. Markopoulou
2	Electromagnetic Radiation	John E. Koundourellis Catherine K. Markopoulou
3	Ultraviolet spectrophotometry	John E. Koundourellis Catherine K. Markopoulou
4	Study of UV spectra (theory needed to interpret Spectra)	John E. Koundourellis Catherine K. Markopoulou
5	Study of UV spectra (theory needed to interpret Spectra)	John E. Koundourellis Catherine K. Markopoulou
6	Study of UV spectra (theory needed to interpret Spectra)	John E. Koundourellis

		Catherine K. Markopoulou
7	Study of UV spectra (theory needed to interpret Spectra)	John E. Koundourellis Catherine K. Markopoulou
8	Study of UV spectra (theory needed to interpret Spectra)	John E. Koundourellis Catherine K. Markopoulou
9	Quantitative determinations using ultraviolet spectrophotometry	John E. Koundourellis Catherine K. Markopoulou
10	Quantitative determinations using ultraviolet spectrophotometry	John E. Koundourellis Catherine K. Markopoulou
11	Flame Photometry and atomic absorption spectrophotometry	John E. Koundourellis Catherine K. Markopoulou
12	Flame Photometry and atomic absorption spectrophotometry	John E. Koundourellis Catherine K. Markopoulou
13	Flame Photometry and atomic absorption spectrophotometry	John E. Koundourellis Catherine K. Markopoulou

B) **Laboratory work**

Lab	**Title: Pharmaceutical Analysis**	**Tutor**
1	Ultraviolet Spectrophotometry, Indroduction,	John E. Koundourellis

	Instrumentation	Catherine K. Markopoulou
2	a) Study of Benzene UV spectra with changes in the monochromator slit width. b) Study of UV spectra of acetylsalicylic acid, phenol, naphthalene, naphazoline ,etc	John E. Koundourellis Catherine K. Markopoulou
3	Changes in UV absorption spectra due to methyl substitution on the aromatic ring of xylene, use of UVPC software	John E. Koundourellis Catherine K. Markopoulou
4	Application of (Standard addition method) to perphenazine, amitriptyline, cyproterone acetate using the UVPC software	John E. Koundourellis Catherine K. Markopoulou

ENGLISH LANGAUGE C

Code number: ΝΠ-16

Cycle: undergraduate

Semester: 3rd

Course type

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 3

Lectures (hours/week): 3

Course coordinator:
Dr Smaragda Christidou-Kioseoglou

Tutor (s):

Dr Smaragda Christidou-Kioseoglou

Aims of the course:

Development of writing skills, further improvement of reading skills and enrichment of vocabulary.

Skills:
Providing side-titles for the paragraphs and paraphrasing.

Teaching methods:
Interactive teaching

Contents of the course:

A. Pre-reading activities

Questions to predict the content of the text and activate existing knowledge.

B. Activities following skimming or scanning

General questions, questions for locating specific information, filling diagrams with the main titles of the text, checking the answers of the prereading questions.

C. Detailed-reading questions

True-False questions, matching side-titles with paragraphs, filling tables and diagrams.

D. Vocabulary learning activities
Guessing the meaning of unknown words from context, blank filling, matching terms with definitions, understanding the meaning of prefixes and unknown words, synonyms, antonyms, providing guided definitions of terms.

Proposed literature:
Ziaka, I. 2010. *English for Pharmaceutical Studies*, vol. II . Thessaloniki: University Studio Press.

Educational activities:
Attendance of lectures

Evaluation process and methods:
One final exam at the end of the semester

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

Power point presentations with interactive activities.
Supplementary teaching material is hosted on the Blackboard Platform e-courses, with open access.

Teaching:

A) **Lectures**.

Lecture	Title	Tutor
1	Advanced Drug Design and development - Introduction	S. Christidou-Kioseoglou
2	Routes of drug administration – Oral route	
3	Rectal route - Parenteral route	
4	Respiratory route	
5	Microorganisms-Viruses	
6	Influence of excipients- Diluents-Surfactants	
7	Lubricants-Disintegrants- Viscosity-enhancing agents	
8	Vaccines	
9	Fever and Hyperthermia	
10	Antihistamines – Adverse Effects- Treatment	
11	Antihistamines – Precautions- Interactions-Uses	
12	DNA – Introduction	
13	Genes - Chromosomes	

MOLECULAR BIOLOGY

Code number: 84

Cycle: Undergraduate, elective

Semester: 3rd semester

Course type

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 2

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): 2

Course coordinator:
Angelos Kanellis, Professor, http://www.pharm.auth.gr/kanellis/

Tutor (s):
1. Angelos Kanellis, Professor, http://www.pharm.auth.gr/kanellis/
Office : Room 315A, 3rd floor Biology /Pharmacy Building

2. Christos Panagiotidis, Professor
Office : Room 315, 3rd floor Biology /Pharmacy Building
Student hours : 11-12 a.m. weekdays
Communication: by Email (pchristo@pharm.auth.gr)

Assisting personnel: -

Aims of the course:

- To enhance the student background of Molecular Biology of the cell.
- To promote the understanding of the complex inter-related and inter-regulated interactions between the various molecular processes of the cell, which are necessary for cell survival and function.
- To explain how the interactions between various biomolecules (e.g. protein-protein or protein-nucleic acid interactions) contribute to the regulation of cellular processes and to the biology of the whole cell.
- To provide knowledge on the molecular mechanisms involved in regulating the various cellular responses to environmental signals.
- To offer the students with hands-on expertise on some of the methodologies often used in the study of the molecular biology of the cell (through laboratory training).

The above targets are achieved through a combination of lectures and laboratory training that represent different and complementary forms of training. The lectures is the major means of knowledge transfer but their major disadvantage is the relatively small audience participation (it should not escape our attention the fact that lecture attendance is not compulsory). On the other side, the compulsory laboratory training helps the students understand the methods used in the analysis of the cellular and molecular processes, as well as of the practical problems that arise during these processes.

Skills: After the successful completion of the Molecular Biology course the students should be able to:

- Describe the major points of DNA structure and replication.
- Describe the key aspects of chromosomal organization, recombination and repair.
- Describe the transcription process and the mechanisms involved in its regulation, as well as the post-transcriptional gene regulation processes. Furthermore, they should be able to describe the mechanisms involved in translational regulation both in prokaryotes and eukaryotes.
- Describe important issues of protein biochemistry, including the processes of protein folding, targeting and transport to the various subcellular compartments.
- Describe major aspects of the cellular signalling processes, both in prokaryotes nad eukaryotes, including the roles of tyrosine kinases, G-proteins, membrane and nuclear receptors and bacterial two-component signal transduction systems.
- Describe the molecular mechanisms leading to the regulation of cell proliferation and programmed cell death.

Teaching methods:

Course lectures and laboratory exercises.

Contents of the course:

Inheritance, genes and DNA. Inheritance and genes. Genes and enzymes. The elucidation of DNA as the genetic material. Structure and organization of the genomes. Genomes of plant cells and of subcellular organelles (mitochondria, plastids). DNA replication. Expression of the genetic information. Relationship between genes and proteins. The role of messenger RNA. The genetic code. RNA viruses and reverse transcription. Transcription, RNA polymerase and transcription factors. Regulation of gene expression at the transcriptional, [post –transcriptional level, as well as at the level of translation. Protein transport into subcellular compartments and its regulation. Signal transduction. Hormones and other molecules involved in signal transduction. Functions of membrane and intracellular receptors. Mechanisms of intracellular signal transduction. Signal transduction and cytoskeleton. Introduction to the recombinant DNA. Restriction enzymes. Cloning vectors. Expression of cloned genes. Principles of DNA sequencing. DNA amplification with the polymerase chain reaction. Functional analysis of genes. Genetic analysis using yeast cells. Site-directed mutagenesis and introduction of mutations in cellular genes.

Proposed literature:

1. Alberts B., Bray D., Hopkin K., Johnson A., Lewis J., Raff M., Roberts K., Walter P. "Essential Cell Biology", 2nd edition, 2006 (Greek translation, Publisher: Iatrikes Ekdoseis P.C. Pashalidis).
2. Watson, J. D., Myers, R.M., Caudy, A.A., Witkowski, J.A. "RECOMBINANT DNA" Edition: 3/2007, Publisher: Akadimaikes Ekdoseis I. Basdra & Co.

Educational activities:

Attendance of course lectures and laboratory exercises.

Evaluation process and methods:

Written final exams at the end of the spring semester or in the autumn examination period. The exact dates and places are organized by the School of Pharmacy.
The examination time is 2 hours.
The students are examined by both tutors and the final grade is the average of the grades given by the two tutors.
Professor Panagiotidis provides 10 questions where the students are asked to define whether the question is correct or wrong (0.1 point per correct answer, -0.1 point per mistaken answer) and to justify their answer (0.4 points per question). All questions are equivalent (0.5 points). Questions that have not been answered correctly by any students are withdrawn and final grade is calculated based on the grades from the remaining questions.
Professor Kanellis provides and additional 5 questions.

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

ICTs are used both in the lectures and the tutorials of the course (PowerPoint and video presentations, interactive tutorials using computer simulations, etc.).

The course lectures, announcements, exam results etc. are posted in the webpages of the two tutors.

Teaching:

Teaching takes place with course lectures and experimental lab work.

C) **Lectures**.

Lecture	Title	Tutor
1	Restriction enzymes	C. Panagiotidis
2-3	DNA cloning, nucleic acid hybridization & PCR.	C. Panagiotidis
4-5	Introduction to the transcription.	C. Panagiotidis
6-7	Eukaryotic transcription	C. Panagiotidis
8-9	Genetic code, disgn of degenerate primers and applications	A. Kanellis
10-11	Mutations and genetic diversity	C. Panagiotidis
12-13	Introduction of mutations, mutant isolation, application of mutagenesis for the isolation of useful genes.	A. Kanellis

B) **Laboratory exercises**

Laboratory	Title	Tutor
1	- *Escherichia coli* cultures on semisolid media. - Assessing of the number of living bacteria in a biological sample or culture. - Transformation of *Escherichia coli* with plasmid DNA and growth of the transformed bacteria in antibiotic-containing growth media.	C. Panagiotidis
2	- Observation of the data obtained form Laboratory exercise 1. -Picking of bacterial colonies under sterile conditions. -Transfer colonies in liquid media, for overnight growth, under sterile conditions.	C. Panagiotidis
3	-Recovery of the *E. coli* cells by centrifugation.	C.

	-Lysis of *E. coli* cells with lysozyme. -Preparation of plasmid DNA and precipitation with isopropanol.	Panagiotidis
4	-Recovery of the plasmid DNA pellet by centrifugation. -Dissolution of the DNA pellet in appropriate buffer solution. Digestion of plasmid DNA with restriction enzymes.	C. Panagiotidis
5	-Electrophoretic separation of the restriction fragments in agarose gels. -Comparison of the mobilities of the restriction fragments with the mobilities of DNA fragments of known size (size markers). -Documentation of the results by digital UV photography.	C. Panagiotidis
6	-Introduction to polymerase chain reaction (PCR). -Identification of the presence of infectious agent DNA in biological samples by PCR.	C. Panagiotidis
7	-Preparation of agarose gels for the analysis of the PCR products. -Electrophoretic separation of the PCR products on agarose gels. -Documentation of the PCR results by digital UV photography.	C. Panagiotidis
8	-Data evaluation and discussion on the results obtained during the laboratory training of the students.	C. Panagiotidis
9	-Writing the laboratory reports and final discussion.	C. Panagiotidis

SEMESTER IV

Pharmaceutical Analysis II
Code number:33
Cycle: Under graduate

Semester: 4

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 7

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): 8

Course coordinator: John E. Koundourellis

Tutor (s):1) John E. Koundourellis
Office 2nd floor, Pharmacy/Biology building ,
Coopreration with the students every day (if the tutor is available) 9:00 a.m.-3:00 p.m. e-mail: koundour@pharm.auth.gr / mobile phone 6944 67 71 35 / office telephone 2310 99 76 43/laboratory telephone 2310 99 76 67

2) Catherine K. Markopoulou
Office 2nd floor, Pharmacy/Biology building ,
Coopreration with the students Wednesday and Thursday 11:00 a.m.-1:00 p.m.
e-mail: amarkopo@pharm.auth.gr/ office telephone 2310 99 76 65/laboratory telephone 2310 99 76 67

Aims of the course: The module enables students not only to identify medicines but also to quantify them in their pure form in pharmaceutical formulations and in biological liquids through various techniques such as Infrared and Near-Infra red Spectrophotometry,Raman Spectroscopy, **Nuclear Magnetic Resonance techniques** (protons and carbon 13),

mass spectrometry and chromatography (**thin layer, paper, open column chromatography, gas chromatography and high-performance liquid chromatography**).
This kind of knowledge is considered fundamental and essential for the possible future professional employment of a pharmacy graduate in a Pharmaceutical Analysis Laboratory.

Skills: To become acquainted with basic concepts of Pharmaceutical Analysis.

Teaching methods: Lectures and laboratory practice. The laboratory practice has been enriched so that students can be acquainted with and become more specialized in understanding the specta of different medicines˙ hence with the additional use of computers to make possible the supervised self-study, which is very useful for the training of the students.
Contents of the course: Infrared Absorption Spectrophotometry,Near-infrared analysis and Raman spectroscopy. Principle of the methods, recording techniques of infrared spectrums, the use of infrared in the qualitative control of the pharmaceutical active substances, clarification of a drug substance, quantification through base-line technique.
Spectroscopy of Nuclear Magnetic Resonance: Principles of the method, scanning techniques, pulse technique, proton NMR spectra, factors influencing chemical shifts-electronegativity-shielding and deshielding : the presence of electro negative **atoms** in the pharmaceutical molecules(electronegative groups ,such as fluorine /iodine etc withdraw electron density from other groups –inductive effect- and this deshielding effect means that the neighbouring hydrogen atoms experience a greater nett magnetic field, and, precess with higher frequency), the induced anisotropic magnetic field around a hydrogen atom-diamagnetic and paramagnetic (deshielding) effect, interpretability of all the data. Application of PMR and CMR to structure confirmation in some drug molecules .Two dimentional NMR spectra .
NMR quantification: quantification of pharmaceutical substances on the basis of the proton absorption resonances. Nuclear Magnetic Resonance spectra of Carbon-13. Quantifications of pharmaceutical substances on the basis of resonance absorption of C-13. **Use an internal standard substance to construct a calibration curve**.
Chromatogaphy: principle, classification of chromatographic methods, applications in Pharmacetical Analysis., the importance of chromatography in Pharmaceutical.Analysis., materials that are used as **stationary phase** in various chromatographic methods. Chromatography isotherms, **open-**column chromatography, flat chromatographic methods: paper chromatography, thin layer chromatography.Gas chromatography (GSC, GLC), liquid chromatography, normal and reverse phase). Comparison of chromatographic methods, chromatographic parameters (development), comparison of chromatographic methods and other analysis methods,

chromatographic systems for HLPC applications. Selection of chromatographic system, preparation and de-gasing of the mobile phase, conservation of the column. Quality evaluation of chromatograms. Development of chromatographic system and improvement of its quality. Applications of chromatographic methods for the determination of active substances in formulations(active ingredients and impurities) and in biological liquids(active compounds and metabolites).Construction of calibration graphs and use of internal standard .
Mass photometry: Basic principle of the method. Ionisation techniques:electron impact,positive ion chemical ionisation, and negative ion chemical ionisation.Mass spectra obtained under electron impact ionisation conditions :homolitic and heterolitic α-cleavage .Cleavage with proton transfer. Fragmentation of ring structures . McLafferty rearrangement . Metastable peaks. Instrumentation:Magnetic sector instruments and Quantropole instruments Characteristics of the molecular ion. Study of splitting mechanisms of various groups of medicines (examples of 2-imidazolines and benzodiazepines). Gas chromatography-mass spectrometry and high performance liquid chromatography-mass spectrometry . Application on different groups of drugs .Exampes from European Pharmacopoeia .

Proposed literature:

Educational activities: Attendance of the lectures and the laboratories, handing in of the laboratory notebook.
Evaluation process and methods: Once the laboratory course is successfully completed with a pass mark(passing grate) and the laboratory notebook is handed in corrected, each student with his/her team should hand in a project on an earlier assigned topic (the project is prepared individually with the responsibility of the student) -the project should be corrected-. At the end of the academic year, students have to undergo oral exams. After having completed the above mentioned obligations, students can participate in the written examinations of the pharmaceutical analysis modules. Cooperativeness, initiative and interpersonal relationship with the instructor plays an important role in the student assessment.

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures: The laboratory has been enriched with electronic educational material, that is, special software in CD-ROM format which contains the spectra of the medicines as well as their solid chemical structure in space (bonds length, ring arrangement, various bonds angles) so that the relation of the medicine structure with the relevant spectrum to be obvious. Moreover, a large part of the laboratory practice is done by the students with the application of a special UVPC programme.
The lectures of the modules are enriched by multimedia use (power point presentations, videos etc).

Teaching: The course is taught both through lectures and laboratory practice.

A) Lectures. The lectures, which last for two hours, take place twice a week in Classroom D12 and multimedia is used to present the topics to be dealt with.

Lecture	**Title**	**Tutor**
1	Infrared Absorption Spectroscopy	John E. Koundourellis Catherine K. Markopoulou
2	Nuclear Magnetic Resonance Spectroscopy	John E. Koundourellis Catherine K. Markopoulou
3	Nuclear Magnetic Resonance Spectroscopy	John E. Koundourellis Catherine K. Markopoulou
4	Assay with NMR	John E. Koundourellis Catherine K. Markopoulou
5	Assay with NMR	John E. Koundourellis Catherine K. Markopoulou
6	Chromatography (Indroduction, Classification)	John E. Koundourellis Catherine K. Markopoulou

7	Chromatography (ανάπτυξη χρωματογραφικών τεχνικών)	John E. Koundourellis Catherine K. Markopoulou
8	Chromatography (Gas Chromatography)	John E. Koundourellis Catherine K. Markopoulou
9	Chromatography (High Performance Liquid Chromatography)	John E. Koundourellis Catherine K. Markopoulou
10	Chromatography (Mobile phase, Solvents)	John E. Koundourellis Catherine K. Markopoulou
11	Chromatography (Chromatographic parameters)	John E. Koundourellis Catherine K. Markopoulou
12	Mass Spectrometry	John E. Koundourellis Catherine K. Markopoulou
13	Mass Spectrometry	John E. Koundourellis Catherine K. Markopoulou

B) **Laboratory work**

Lab	**Title**	**Tutor**

1	Determination (using the calibration curve) of furosemide in pharmaceutical formulations (tablets). Study with UV Spectrophotometry (Part A)	John E. Koundourellis Catherine K. Markopoulou
2	Determination (using the calibration curve) of furosemide in pharmaceutical formulations (tablets). Study with UV Spectrophotometry (Part B)	John E. Koundourellis Catherine K. Markopoulou
3	Study of UV spectrum of bromhexine hydrochloride and its calibration curve. Dilution factors, calculations. Overall Recovery	John E. Koundourellis Catherine K. Markopoulou
4	Study UV spectrum of Ifeprodil. Standard addition method. UV spectrum derivative techniques	John E. Koundourellis Catherine K. Markopoulou

PHARMACEUTICAL CHEMISTRY (ORGANOMETALLIC COMPOUNDS AND HORMONES)

Code number: 34

Cycle: Undergraduate

Semester: 4th semester

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS):
7
Lectures (hours/week):
3
Tutorial (hours/week):
-
Laboratory work (hours/week):
2
Course coordinator:
Athina Geronikaki Professor

Tutor (s):
Athina Geronikaki, professor
Room, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: email (geronik@pharm.auth.gr)

Dionysia Papagiannopoulou, lecturer
Room 423a, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310-998680, email (papagd@pharm.auth.gr)

Assisting personnel: One technician

Aims of the course:

This course is addressed to 4th semester pharmacy students and it aims at a basic level of knowledge on the synthetic methods and characterization of hormones as well as metallic complexes with application in therapy or diagnosis. At a second level it covers the structure-activity relationship of hormones and influence of their absence on the organism as well as chemical interactions between metals and biomolecules. Futhermore, it focuses on the chemistry, drug design and mechanism of action of hormones and complexes.

Skills:

By the end of this course, the students should be able to:
Relate structural features to biologic activity
Comprehend the interactions of metals with biomolecules
Synthesize and characterize hormones and the structure of complexes

Teaching methods: Lectures and laboratory work. The material is covered by a textbook and laboratory notes.

Contents of the course:

Introduction to hormones. Classification of hormones and their studies from chemical, biological and therapeutical points of view. Design, synthesis, qualitative and quantitative evaluation of hormones, structure-activity relationships. Antagonist of hormones. Metabolism and mechanism of action. Role in the organism . Hormones as contraceptives. Insulin, calcitonin, hormones of hypophysis and hypothalamus.

Introduction to metal complexes: Chemical formulas, nomenclature, stereochemistry, synthesis of complexes. Importance of metals in living organisms.: trace elements, essential, non-essential. Metal complexes in biological systems, complexation with amino acids, with prosthetic groups. Introduction to the physiological function of metals in living organisms (charge carriers, strorage, molecule carriers, electron carriers, detoxification, enzymatic catalysis). *Chelation therapy*. Abnormalities in calcium metabolism-osteoporosis: diphosphonates (sodium alendronate): design, synthesis, drug action. Heavy metal intoxication: principles for the design of chelating agents. Chemistry and mechanism of toxicity of heavy metals: arsenic, lead, mercury. Copper metabolism (Wilson desease). Chelating agents as antidotes (synthesis, drug action, distribution-pharmacokinetics): desferral, 2,3-dimercaprol, dimercaptosuccimic acid, D-penicillamine,

disodium-EDTA, calcium, disodium-EDTA, trientine. *Application of metallic complexes in therapy*. Anticancer platinum complexes (design-synthesis, drug avction, metabolism): cis-diammine-dichloro-platinum, carboplatin. Antirheumatic gold compounds (synthesis, biotransformation-metabolism, drug action) first and second generation gold compounds. *Application of complexes in diagnosis-imaging agents*. Principles of design of complexes for diagnosis. Properties of radioisotopes (^{99m}Tc) for application in radioimaging (scintigraphy). Imaging modalities. Properties of metal complexes for use in magnetic resonance imaging (MRI). Gadolinium compounds.

Proposed literature:

1. A.Geronikaki. «Organic Pharmaceutical Chemistry». 3 2006
2. E. Chiotellis, D. Papagiannopoulou "Chapters of bioinorganic pharmaceutical chemistry" 4rd Ed. 2011 (in Greek). (Available via Blackboard and the website user.auth.gr/papagd/Organometallika)
3. Laboratory Experiments (Available via Blackboard and the website user.auth.gr/papagd/Organometallika)

Educational activities: Lectures, discussion with the students in every lecture, problem solving and practical work in the laboratory.

Evaluation process and methods: Examination of the course can be done either by successful participation in two written mid-term exams (grade ≥5 in each mid-term exam) of by a final written examination at the end of the semester. Student eligibility to participate in the mid-term exams is gained by regular attendance of the lectures throughout the semester**.** The evaluation process is based on questions that the students are asked to answer based on their knowledge obtained from the lectures as well as on the critical thinking and ability to combine, evaluate and handle the acquired knowledge and information.
The duration of the examination is 3 hours.
The examination at the end of the semester is performed at dates, time and place arranged by the department.
During the laboratory work, students hand over a report of their results and are evaluated. At the end of the laboratory work, there is a written examination on this. Successful termination of the laboratory course permits their participation to the final examination.
At the examination of the course, each tutor gives out separate exam forms. To compute the final grade, the grade given by each tutor is weighted proportionately to the number of hours he/she has taught.
Final grade is calculated by addition of the course exam grade (90%) and the lab exam grade (10%).

Example: Supposing a course, where 60% of the hours are taught by tutor A and 40% by tutor B, the final grade is calculated by the following formula:

$$F.G.= 0.9(a+b) +0.1c,$$

Where, a the grade given by tutor A (in a scale of 0-6), b the grade given by tutor B (in a scale of 0-4), c the lab exam grade.

Use of TIC / Electronic distribution of the lectures

Powerpoint presentation is used in the lectures.

Teaching: Teaching of this course is accomplished through lectures and laboratory work.

A) **Lectures**. Lectures (39 of 1 hour each) are given in the lecture room Δ12 (this is a room of limited capacity, located in a different building).

Lecture	Title	Tutor
1-2	Introduction to hormones. Thyroid hormones	A. Geronikaki
3-5	Hypo/hyperthyroidism, Antithyroid hormones, Adrenal hormones.	A. Geronikaki
6-8	Corticoids	A. Geronikaki
9-10	Androgens	A. Geronikaki
11-13	Anabolic hormones	A. Geronikaki
14-16	Estrogens	A. Geronikaki
17-19	Synthetic analogs of estrogens	A. Geronikaki
20-22	Inhibitors of aromatase. Progestines	A. Geronikaki
23-25	Estrogen-Progestines combination, Contraceptives	A. Geronikaki
26-27	Insulin, calcitonin, hypothalamic hormones, hormones of hypophisys	A. Geronikaki
28	Introduction to metal complexes	D. Papagiannopoulou
29-30	Coordination of metals with biomolecules-Metalloenzymes	D. Papagiannopoulou
31-32	Heavy metals and mechanism of toxicity	D. Papagiannopoulou
33-34	Chelation therapy for heavy metal poisoning (Synthesis-drug action)	D. Papagiannopoulou
35	Osteroporosis and diphosphonates (Design-synthesis and mechanism of drug	D.

	action)	Papagiannopoulou
36-37	Anticancer platinum complexes (Design-synthesis and mechanism of drug action)	D. Papagiannopoulou
38	Antirrheumatic gold complexes (Synthesis-mechanism of drug action-Biotransformation products)-Sodium Nitroprusside (synthesis-mechanism of action-metabolism)	D. Papagiannopoulou
39	Coordination compounds as imaging agents –Radiodiagnostics and Scintigraphy (Properties of radionuclides-Imaging devices)-Contrast agents in magnetic resonance imaging (General properties-Gadolinium compounds)	D. Papagiannopoulou

B) Laboratory work

Students must do laboratory work.

ATTENTION! The students have to register for the lab at the dates indicated following an announcement, before the beginning of the semester at the Laboratory of Pharmaceutical Chemistry. The announcement is posted at the announcement board of the Laboratory of Pharmaceutical Chemistry (4^{th} fl).

Laboratory	**Title**	**Tutor**
1	Synthesis of $CuCl_2DMSO_2$ complex	D. Papagiannopoulou
2	Crystallization of $CuCl_2DMSO_2$ complex	-//-
3	Synthesis of copper-penicillamine complex	-//-
4	Crystallization of copper-penicillamine complex	-//-
5	Infrared spectroscopy of $CuCl_2DMSO_2$ complex	-//-
6	Infrared spectroscopy of copper-penicillamine complex	-//-

7	Preparation of standard solutions of copper sulfate	-//-
8	Measurement of standard solutions of copper sulfate in UV-Vis spectrophotometer	-//-
9	Preparation of standard curve and measurement of unknown solution	-//-
10	Preparation of solutions of Nickel chloride-EDTA	-//-
11	Measurement of Ni-EDTA solution in UV-Vis spectrophotometer	-//-
12	Determination of stoichiometry of reaction	-//-
13	Laboratory Test	**-//-**

BIOCHEMISTRY II

Code number: 31

Cycle: Undergraduate

Semester: 4th

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 5

Lectures (hours/week): 3

Tutorial (hours/week):

Laboratory work (hours/week):

Course coordinator:
Anastasia Pantazaki

Tutor (s):

Dimitrios Kyriakidis, Professor

Office 504, 4th floor building Chemical
Cooperation with students: daily 11-12 a.m.
Contact: by email (kyr@chem.auth.gr)

Giannakouros Thomas, Associate Professor
Office 501, Chemical building 4th floor
Cooperation with students: daily 11-12 a.m.
Contact: by email (giannako@chem.auth.gr)

Anastasia Pantazaki, Lecturer (Coordinator)

Office 511, 4th floor building Chemical
Cooperation with students: daily 11-12 a.m.
Contact: by email (natasa@chem.auth.gr)

Assisting personnel:

Aims of the course:

The understanding on the part of students of biological macromolecules and mechanisms of biosynthesis and catabolism
Useful examples for students of pharmacy are given: such as biochemical basis of various diseases and the impact of specific medicines in biochemical and bio-molecules.

Skills:

Familiarity with basic concepts of biochemistry.

Teaching methods:

Lectures in class

Contents of the course:

Carbohydrate metabolism (organic chemistry important carbohydrates, dietary carbohydrate utilization, glycolysis, alcoholic fermentation, phosphoric pentose pathway hydrolytic and phosphorolytic glyconeogenesis polysaccharides degradation, photosynthesis, biosynthesis di-and polysaccharides) – metabolism of lipids (lipids, organic chemistry major dietary lipids utilization, b, a and z-oxidations, fatty acids, triglycerides biosynthesis, phosphoglycerides, sfigolipids, isoprenoeids and ketobodies lipids) – Biosynthesis and degradation acids, Nucleic purines and pyrimidines. Metabolism and biosynthesis of amino acids – Organic nitrogen urea Cycle.
Metabolic role of nucleic acids,Biosynthesis of proteins – metabolism of inorganic compounds (water-permeable, active permeability,Acid-basic balance – dietary requirements in minerals) – Vitamins (liposoluble

vitamins, biochemistry optical excitation, blood coagulation, water-soluble vitamins and their role as co-enzymes) – Hormones the role of cyclic AMP receptors, amino acid derivatives, hormones, hormones, steroid prostagladines herbal hormones).

Proposed literature:

1. Introduction to Biochemistry: J.C. Gewrgatsos (versions: Giachoudi) 6th Edition, Thessaloniki, 2005).

Lecture	Title	Tutor
1	Basic concepts of metabolism	D. Kyriakidis
2	structure and characterization of polysaccharides	D. Kyriakidis
3-4	Glycolytic pathway and carbohydrates catabolismos	D. Kyriakidis
5	Phosphoric pentose pathway glyconeogenesis	D. Kyriakidis
6	Photosynthesis – Light reactions	D. Kyriakidis
7-8	Dark reactions of Photosynthesis-Calvin cycle	D. Kyriakidis
9	Biosynthesis glycogen stores and energy efficiency of sugars.	D. Kyriakidis
10	Lipid Structure-structure of cell membranes	T. Giannakouros
11-12	Catabolism of lipids, Metabolism of neutral fats, fatty acids, phosphoglycerides	T. Giannakouros
13-14	Triglycerides Biosynthesis of fatty acids, Phosphoglycerides, isoprenoeids, ketobodies. Energy efficiency	T. Giannakouros
15-16	Amino acid Metabolism-urea cycle	T. Giannakouros
17	Convertion of ammonia into organic nitrogen, biosynthesis of amino acids.	T. Giannakouros
18	Biologically important derivatives of amino acids	T.

		Giannakouros
19	Biosynthesis porphrines, catabolism of protein, energy efficiency	T. Giannakouros
20-21	Primary and Secondary nucleic acids structure. Viruses, plasmids, catalytic RNA (ribosomes)	T. Giannakouros
22	Nucleic acid Biosynthesis. DNA Synthesis	T. Giannakouros
23	Correction of DNA (mechanisms, enzymes)	T. Giannakouros
24-25	Biosynthesis of RNA. Basic principles of mechanism, enzymes and transcription.	T. Giannakouros
26	Catabolism of purines-pyrimidines	T. Giannakouros
27	mRNA Maturation of molecules in eukaryotes	A. Pantazaki
28	genetic code	A. Pantazaki
29	protein Mechanism composition	A. Pantazaki
30-31	Regulation of proteïn composition, homeopolic regulations, peptides marks, proteolytic maturation of insulin.	A. Pantazaki
32	Senior Assembly configurations of proteins, proteΐ nes escorts, finding of intracellular proteins	A. Pantazaki
33-34	Enzymes of recombinant DNA technology, construction of plasmid with foreign genetic material, recombination, process, construction of cDNA cloning, DNA polymerase chained reaction	A. Pantazaki
35-36	Water Channels-Hydropores-ion channels-ion-Pumps-ion transporters Ionic carriers	A. Pantazaki

37	Acid-basic balance of man	A. Pantazaki
38	Molecular basis of optical excitation ofvitamin A	A. Pantazaki
39	Second messages-Hormones, cytokines-Interferones	A. Pantazaki

2. Biochemistry, volume II, Biochemistry, volume 2: Berg Tymoczko L.J., M.J., Stryer l. (A. Aletras, I.D. Balkana Drainas, H. Kouvelas, G.K. Papadopoulos, M. Franc-Lazaridi versions Uc), 2005.
3. Basic Biochemistry: K.A. Dimopoulos, A.. Andonopoulou-Wilson (versions: co-edition with P. Antonopoulou-Wilson-Provider-Publisher KONSTANTINOS A. DEMOPOULOS) 2nd adopted, Athens 2009.

Educational activities:
Monitoring of lectures.

Evaluation process and methods:
Written mid-term progress assessment (s) or written examination at the end of the semester

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures
The lectures of the course made using slides
Announcements, rankings, etc. posted on the Bulletin Board of the laboratory of biochemistry.

Teaching:
The teaching of the course are lectures.

A) **Lectures**.

The lectures (1 hour) takes place three times a week

PHARMACEUTICAL TECHNOLOGY UNIT OPERATIONS

Code number: 46

Cycle: Undergraduate

Semester: 4th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 6

Lectures (hours/week): 3

Tutorial (hours/week): 1

Laboratory work (hours/week): 6

Course coordinator:
Ioannis Nikolakakis Ass. Professor

Tutor (s): Ioannis Nikolakakis, Ass. Professor

Assisting personnel: D. Fatouros, Ass. Professor

Aims of the course: Basic knowledge of the design and operation of pharmaceutical units and of the steps of development of dosage forms through to the final product and submission to the Health authorities for Production licence and marketing.

The concept and the importance of particle size and particle shape in drug formulation. Understanding of the mechanism of basic pharmaceutical operations including size reduction, mixing, separation processes, filtration, drying and freeze-drying, its importance in drug formulation and practical application on a laboratory scale. The teaching with lecture presentation is

enhanced with practical classes using drugs and excipients of pharmaceutical specifications.

Skills: Familiarisation with basic pharmaceutical processes and application of the knowledge to solve formulation problems on a laboratory scale.

Teaching methods:

Power point lecture presentations, demonstrations and practical classes

Contents of the course: The design and operation of pharmaceutical industry. Development of pharmaceutical dosage forms. Production licence. Basic pharmaceutical operations. Size reduction – Mechanism, material properties, energy considerations, specific cases. Methods and milling equipment. Size distribution of the productand changes during milling. Mechanical separation of particles. Methods, assessment of efficiency. Separation from air with sieving, aerodynamic classification, sedimentation, elutriation. Filtration and factors that affect the filtration rate, mechanisms and filtration means. Mixing of powdered materials – Mechanism of random mixing and interactive mixing. Sampling techniques, size and mixing indices. Factors affecting the mixing process. Types, characteristics and operation of mixers. Drying- Definitions. Measurement of relative humidity. Theory of drying, movement of liquid during drying, mechanism of heat transfer, drying periods, equilibrium moisture and influence of material. Dryers. Freeze drying – Principles of freeze-drying and applications in Pharmacy.

The practical classes involve the processes of Particle size analysis by sieving and air permeability, size reduction, mixing and drying. Computers and appropriate software are used for data processing.

Proposed literature:

- I. Nikolakakis Lecture notes on Pharmaceutical Unit Operations (2010). They are aupdated every year and are made available in the internet through the Blackboard.
- T. Allen. Particle Size Measurement, 3rd edition Chapman and Hall, 1981

Aulton M.E. (editor) Pharmaceutics The Science of Dosage Form Design Churchill Livingstone 2nd edition, 2002.

Educational activities:

Lectures and practical classes. The main goals of the subject are to understand the concept of particle size and its measurement. The understanding of basic processes applied in the production of medicines. The purpose of laboratory classed is to familiarise the students with the above processes.

Evaluation process and methods:

Sitting 3h examination at the end of Semester. Evaluation is based on the student response in writing on 5-6 topics plus 1-2 questions/problems from laboratory work. Results are disclosed and shown on notice board of The Department within 1-2 weeks from the examination. Before sitting the exam the student completes a written detailed report on the work conducted in the practical classes

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

The lectures and tuition presentations are delivered using Powerpoint, video presentations etc.)

Teaching:

A) **Lectures**.

They are 3h presentations once a week in Room D12 of Physics Dept and delivered via electronic means. Teaching material including overhead projections and PowerPoint slides, lecture notes (150 pages) and Laboratory Class manual are available to the students via the Blackboard program operated by the University Library.

Lecture	Title	Tutor
1	Pharmaceutical industry	I. Nikolakakis
2	Particle size analysis, particle diameters and shape	I. Nikolakakis
3	Size distributions and particle size analysis methods	I. Nikolakakis
4	. Size reduction – possible influence of crystallinity and fracture mechanism	I. Nikolakakis
5	Size reduction – description and operation of mills	I. Nikolakakis
6	Mechanical separation of particles and evaluation of the efficiency of the process – Aerodynamic classifiers, separation in gas and liquid medium. Filtration and factors that affect, mecahanisms and equipment	I. Nikolakakis
7	Powder mixing – Mechanism of random and interactive mixing. Sampling, sample size and mixing indices	I. Nikolak I. Nikolakakis akis
8	Factors affecting the result of mixing process	
9	Drying –Definitions. Measurement of relative humidity. Drying theory, heat transfer, movement of water through the powder during drying, drying periods, moisture content	I. Nikolakakis
10	Dryers – Characteristics and operation	I. Nikolakakis

11	Freeze drying – Characteristics and operation	
12	Supercritical fluids I	D. Fatouros
13	Supercritical fluids II	D. Fatouros

B) **Laboratory work**

Laboratory	**Title**	**Tutor**
1	Size reduction and size analysis by analytical sieves and air-permeametry	.I.Nikolakaiis
2	Powder mixing	D. Fatouros
3	Drying of lactose granules	I.Nikolakakis
4	Size analysis by Sedimentation - Andreassen Pipette	I.Nikolakakis

c) **Tutorials**

Tutorial	**Title**	**Tutor**
1	Calculations involved in the laboratory classes. Discussion of the results	

PHYSIOLOGY 2 & HUMAN PATHOPHYSIOLOGY

Code number:NP31

Cycle: Undergraduate

Semester: 4th

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 3

Tutorial (hours/week):

Laboratory work (hours/week): 2

Course coordinator: George Anogeianakis (Professor)

Tutor (s):
1) George Anwgeianakis (Professor)
Cooperation with students
Contact: Tel. 2310 999054, email: anogian@auth.gr
2) D. Koytsonikolas (Associate Professor)
3) V. Stergiou-Michaelidou (Assistant professor.)

Assisting personnel:

Aims of the course:

Knowledge of the physiological function of the nervous, digestive and endocrine system of the human body.

Skills:
Theoretical lesson: learning the operation of the systems of the human body Laboratory exercises: the familiarization of students in methodology on issues contained in the material of the theoretical lesson.

Teaching methods: Lesson from the amphitheatre: the total of operating mechanisms of these systems in conjunction with basic anatomical concepts associated with the above functions. Laboratory exercises: their content refers to basic sections of the above-mentioned systems. Use of video projection and simulation programs to PCs. more detailed analysis on the targets of the course reported on the websites: **http://www.experimentalphysiology.gr** and **http://physiology.med.auth.gr.** At the end of the exercises carried out examinations on development issues.

Contents of the course: Organization and functions of the nervous system. Aesthetic physiology.Active body system. Gastrointestinal tube. Movemement through the gastrointestinal tract. Gastrointestinal secretions. Hepatic-bileduct function, digestion and absorption. General principles of Endocrinology and hormones of the pituitary glands and the hypothalamous. Thyroid hormones. Hormones of the adrenal glands. Pancreas as endocrine portion. Hormones that regulate calcium. Hormones of the reproductive system.

English Language IV

Code number: NP-21

Cycle: undergraduate

Semester: 4th

Course type

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 3

Lectures (hours/week): 3

Course coordinator: Dr Smaragda Christidou-Kioseoglou

Tutor (s):
Dr Smaragda Christidou-Kioseoglou

Aims of the course:
Further development of writing skills, improvement of reading skills, enrichment of vocabulary.

Skills:
Summarising, quoting directly, referring to sources.

Teaching methods:
Interactive teaching

Contents of the course:

A. Pre-reading activities

Questions to predict the content of the text and activate existing knowledge.

B. Activities following skimming or scanning

General questions, questions for locating specific information, filling diagrams with the main titles of the text, checking the answers of the pre-reading questions.

C. Detailed-reading questions

True-False questions, matching side-titles with paragraphs, filling tables and diagrams.

D. Vocabulary learning activities

Guessing the meaning of unknown words from context, blank filling, matching terms with definitions, understanding the meaning of prefixes and unknown words, synonyms, antonyms, providing guided definitions of terms.

Proposed literature:
Ziaka, I. 2010. *English for Pharmaceutical Studies*, vol. II . Thessaloniki: University Studio Press.

Educational activities:
Attendance of lectures

Evaluation process and methods:
One final exam at the end of the semester

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

Power point presentations with interactive activities.
Supplementary teaching material is hosted on the Blackboard Platform e-courses, with open access.

Teaching:

A) **Lectures**.

Lecture	Title	Tutor
1	Adrenocorticoids	S. Christidou-Kioseoglou
2	Topical Glucocorticoids	
3	Inhaled and Intranasal Glucocorticoids	
4	Pharmaceutical Proteins	
5	Characteristics of phytomedicines	
6	The human nervous system	
7	Peripheral nervous system	
8	Autonomic nervous system	
9	Chemical anatomy – Cholinergic transmission	
10	Adrenergic transmission	
11	Mechanisms involved in the induced differentiation of leukemia cells - ARTICLE (I) Abstract – Introduction	
12	(II) Conventional cancer chemotherapy: successes, failures and obstacles	
13	(III) Induction of differentiation and apoptosis in leukemic cells	

ORGANIC- AND RADIO-PHARMACEUTICAL CHEMISTRY III

Code number: NP32
Cycle: Undergraduate
Semester: 4th semester

Course type

X	Background/General knowledge
	Scientific area (Pharmacy)

Credit Units (ECTS): 2
Lectures (hours/week): 2
Tutorial (hours/week): -
Laboratory work (hours/week): -
Course coordinator: Yiangou Minas, Professor

Tutor (s):
Yiangou Minas, Professor
Room 7.13, 7th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310-99833, email (yiangou@bio.auth.gr)

Assisting personnel: -
Aims of the course: To provide knowledge the higher organisms capacity that through the molecular and cellular elements of the immune system, develop mechanisms recognizing "self" from "non-self" components of the host-organism or the environment and exhibit natural innate or adaptive defense mechanisms leading in their neutralization or their selective tolerance. To familiarize students with the complex host defense mechanisms against external pathogens or infective environmental factors.

Skills: : By the end of this course, the students should be able to recognize the molecular and cellular components of immune system in association with knowledge using antibodies or antigens as basic tools in prevention-

protection against pathogens, in diagnosis, in research as well as in the development of immunotechnology.

Teaching methods: Lectures

Contents of the course:

1. Basic principles, historical aspects and evolution.
2. Organization of immune system and lymphatic system.
3. Host-defense mechanisms, Active (Vaccines) and passive (antisera) immunization.
4. Structure and function of antibodies. Genetic and molecular basis of antibody variation. 5. Immunogens/antigens.
6. Complement
7. Mechanisms of humoral and cellular immunity (molecular and cellular regulation-immunotolerance).
8. Major Histocompatibility complex and Transplantations.
9. Immunobiology of cancer – Autoimmunity.
10. Future and prospective.

Proposed literature:

1. IMMUNOBIOLOGY – Lygeri Hadjipetrou-Kourounakis - UNIVERSITY STUDIO PRESS 1987

2. **IMMUNOLOGY -**RICHARD GOLDSBY, THOMAS KINDT, BARBARA OSBORNE, JANIS KUBY**-**GREEK: ECATERINI GAITANAKI, CONSTANTINOS BAXEVANIS **–** MEDICAL EDITIONS P.C> PASCHALIDIS

Educational activities: Lectures, discussion with the students in every lecture.

Evaluation process and methods: Examination of the course can be done by a final written examination at the end of the semester. The exam includes 5 questions one of which requires critical thinking to answer. The duration of the examination is 3 hours.

Use of TIC / Electronic distribution of the lectures

Powerpoint presentation is used in the lectures and supporting material concerning immunology is located at http://www.lib.auth.gr/index.php/el/blackboard.

Teaching: Teaching of this course is accomplished through lectures 2 hours per week

A) **Lectures**. Lectures are given in the lecture room Δ12 for 13 weeks

B) .

Lecture	**Title**	**Tutor**
1	Basic principles of immunity, historical aspects and evolution of immunobiology	Minas Yiangou
2	Organization of immunology system – cells and molecules of the immune system	"
3	Organization of immunology system – tissues and organs of the immune system	"
4	Host resistance: Innate and adaptive/Cellular and humoral immune response/Active and passive immunization (vaccines-antisera)	"
5	Molecules involved in immune responses/Immunogens-Antigens Complement & immune responses	"
6	Molecules involved in immune responses/Antibodies-Monoclonal antibodies (structure-activity-gene expression)	"
7	Receptors of I]immune cells – Major Histocompatibility Complex and immune responses	"
8	Mechanisms of humoral immunity/Stimulation and activation of B-lymphocytes	"

9	Mechanisms of cellular immunity/Stimulation and activation of T-lymphocytes	"
10	Mechanisms of immunotolerance and immunoregulation	"
11	Histocompatibility and immunobiology of transplantation	"
12	Autoimmunity/Immune system & cancer	"
13	Future and prospective	"

CLINICAL CHEMISTRY
Code number: 80

Semester:4th

Course type Undergraduate

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 2

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): 2

Course coordinator: Pantelis Arzoglou, Ass. Professor

Tutor (s):
Pantelis Arzoglou, Ass. Professor,
Thomas Giannakouros, Ass. Professor,
Konstantinos Kotinis, Lecturer.

Assisting personnel:
Antonios Karagiorgas, EDIP,
Sofia Rammou-Asvesta, ETEP

Aims of the course:
Correlation with physiological biochemical parameters and pathological situations. Quality control laboratory analyses. Methods of determination.

Skills:
Familiarity with basic concepts of Clinical Chemistry and Pathological Biochemistry.

Teaching methods:
Teaching using modern technology (animations) and laboratory exercises.

Contents of the course: Separation and analysis methods. Quality control in clinical chemisty laboratory. Protein. Amino acids and derivatives.

Carbohydrates. Lipoproteines and lipids. Enzymes. Laboratory test functioning of endocrine, kidney, stomach, pancreas and bowel. Various fluids of the body. Acid basic balance and electrolytes. Automatic analysers. Coagulation of blood. Modern analytical methods (ELISA, western blot). Isotopic analysis methods. Data processing aiming at diagnosis.

Proposed literature:

1. (M) Georgatsou, e.g. Arzoglou: principles of Clinical Chemistry, Editions Giachoudi, Thessaloniki
2. p. karlson, Gerok w., w. Gross. Clinical Pathological Biochemistry, Special Edition Versions, Athens

Educational activities:

Monitoring of lectures and laboratory exercises.

Evaluation process and methods:

Examination with traditional issues in conjunction with multiple choice questions

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

The lectures of the course carried out using ITC (Powerpoint presentation, videos, animations etc).

Teaching:

Lectures.

The teaching of the course are lectures and exercises.

a) Lectures. The lectures (1 hour) take place 2 times a week in room A12.

Lecture	Title	Tutor
1-2	Introduction-Meaning physiological values	Arzoglou
3-4	Enzymes	Arzoglou
5-6	Hormones	Kotinis
7-8	. Lipids& lipoproteins	Arzoglou

9-10	Automatic analysers	Arzoglou
11-12	Carbohydrates	Arzoglou
13-14	Hepatic-Pancreas function	Kotinis
15-16	Modern analytical methods	
17-18	Proteins	Kotinis
19-20	Blood Coagulation	Arzoglou
21-22	Sample Preparation	Kotinis
23-24	Acid basic balance	Arzoglou
25-26	Renal function	Kotinis

B) **Laboratory work**

Laboratory	**Title**	**Tutor**
1	General urine analysis,	Arzoglou, Kotinis
2	Microscopic observation of biolgical fluids	Arzoglou, Kotinis, Asvesta
3	Investigation of diabetes mellitus, measuring glycosidised haemoglobin,	Arzoglou, Kotinis, Karagiorgas

SEMESTER V

DISPENSING PHARMACY

Code number: 32

Cycle: UNDERGRADUATE STUDIES

Semester: 5th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week):

Laboratory work (hours/week): 2

Course coordinator:
KATSIOTIS STAVROS (Associate Professor)

Tutor (s): KATSIOTIS STAVROS (Associate Professor)
e-mail: stakat@pharm.auth.gr

Assisting personnel: ATHANASIOU ANASTASIOS

Aims of the course: The main target of the dispensing is the acquisition of the necessary knowledge for the recognition and comprehension of the prescriptions following by the preparation of the appropriate technological formulation.

Skills: Acquisition of the necessary knowledge and possibilities for the recognition either of the raw material that are used in the different types preparations of the technological formulations, as far as the evolvement of the student skills in the management of the different preparation methods of the formulations. Nevertheless the students will be familiarized with the handling of the different laboratory apparatus and implements.

Teaching methods: Lectures and Laboratory exercises.

Contents of the course: Prescription, Dispensing, dosimetry, Pharmacopoeia, Formulations liquid, solids, aromatic waters, solutions, drops, syrup, emulsions, suspensions, ointments, pastae, suppositories, tablets, capsules, extractions, essential oils, labels, medicinal gas, bandages, incompatibilities, dispensing problems.

Proposed literature: GALENIC PHARMACY

Educational activities:
Attendance of the lectures and the Laboratory exercises.

Evaluation process and methods:
Attendance of the Laboratory exercises regularly, writing and presentations of specified reports; evaluation.
Written exams at the end of the semester

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures
Certain lectures are carried on with the use of electronic applications

Teaching:

A) **Lectures**. Two hours per week in the Δ12 classroom of the School of Science

Lecture	**Title**	**Tutor**
1	Introduction, dispensing	**Katsiotis S.**
2	Prescriptions, Liquid formulations	**Katsiotis S.**
3	Syrup, emulsions, suspension	**Katsiotis S.**
4	. Ointments, crèmes	**Katsiotis S.**
5	Suppositories	**Katsiotis S.**
6	Tablets, capsules	**Katsiotis S.**
7	Parenterally	Katsiotis S.
8	Extractions	Katsiotis S.
9	Essential oils	Katsiotis S.
10	Essential oils winning	Katsiotis S.
11	Packing materials	Katsiotis S.

12	Labels, Bandages	Katsiotis S.
13	Incompatibility	Katsiotis S.

B) **Laboratory work**

Laboratory	**Title**	**Tutor**
1	Formulation of different Preparations	Katsiotis S.
2	Formulation of different Preparations	Katsiotis S.
3	Formulation of different Preparations	Katsiotis S.
4	Formulation of different Preparations	Katsiotis S.
5	Formulation of different Preparations	Katsiotis S.
6	Formulation of different Preparations	Katsiotis S.

Syllabus: PHARMACOLOGY I

Code number: 49

Cycle: UNDERGRADUATE

Semester: 5th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 6.5

Lectures (hours/week): 3

Tutorial (hours/week): 1

Laboratory work (hours/week): 2

Course coordinator: Asterios S. Tsiftsoglou

Tutors:
1. Asterios S. Tsiftsoglou, Professor
2. Theodore Sklaviadis, Professor
3. Ioannis S. Vizirianakis, Associate Professor

Assisting personnel:
1. Ioannis Bonovolias, M.Sc., Predoctoral fellow
2. Elsa Amanatiadou, M.Sc., Predoctoral fellow
3. Ioannis Paspaltzis, M.Sc. Research assistant

Aims of the course: To introduce students into the basic principles of Pharmacology; the pharmacodynamics and pharmacokinetics parameters of drugs; the various pharmacological classes of drugs; the mechanism underlying the actions of the drugs in the body; the factors contributing to

pharmacological response; the emergence of adverse drug reactions (ADRs); drug interactions; drug dosage scheme selection upon drug prescription and drug delivery in clinical practice.

Skills: Lectures, tutorials and laboratory tests

Teaching methods: Lecture presentations, Computer-Assisted Learning in Pharmacology (PCAL), Tutorials, and Discussion of specific drug-related case studies

Contents of the course: Introduction to Pharmacology; Drug-receptor interactions; Mechanisms underlying the emergence of drug resistance; Pharmacogenetics-Pharmacogenomics and drug idiosyncrasy; Pharmacokinetics processes: absorption, distribution, metabolism, excretion (ADME); Drug interactions; Neuron cell types; Synapses; Taxonomy of neuronal receptors; Mechanism of action and structure-activity relationships of neurotransmitters; Autonomous nervous system; Parasympathomimetic drugs acting either in muscarinic or nicotinic receptors; Acetyl-cholinesterase-inhibiting drugs; Parasympatholytic drugs; Autonomic ganglia-blocking drugs; Skeletal muscle relaxant drugs; Sympathomimetics acting on adrenergic alpha- or beta- receptors; Sympatholytics acting on adrenergic alpha- or beta- receptors; Cardiac glycosides and positive inotropic agents; Diuretic drugs; Antihypertensive and anti-angina agents; Antiarrhythmic agents; Histamine and antihistaminics; Ergot alkaloids; Bronchodilators and other agents used for the treatment of asthma; Local anaesthetics; Drugs acting in gastrointestinal tract and the liver-bile duct system; Anti-hypercholesterolemia drugs; Hormones of hypothalamus and pituitary gland (hypophysis); Thyroid hormones and related drugs; Adrenal glands hormones and related agents; Estrogens; Androgens; Diabetes, Insulin and related drugs; Vitamins.

Proposed literature:
Textbooks written in Greek and English as well as pharmaceutical journals

Educational activities:

Evaluation process and methods:
Exams at the end of the semester; essay submission in laboratory tests

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures
PowerPoint slides, computer use, PCAL CD-ROMs, videos. The lectures of Prof. T. Sklaviadis are available to students in his web homepage. The lectures of Assoc. Prof. I.S. Vizirianakis are available in PDF format to students in the homepage of "e-Class AUTh" (www.e-class.auth.gr)

Teaching:

D) **Lectures**.

Lecture	Title	Tutor
1	Introduction to Pharmacology	A.S. Tsiftsoglou
2	Pharmacokinetics – Drug metabolism and drug interactions	A.S. Tsiftsoglou
3	Drug-receptor interactions	A.S. Tsiftsoglou
4	Mechanisms underlying the emergence of drug resistance Pharmacogenetics and idiosyncrasy of drug actions	A.S. Tsiftsoglou
5	Pharmacokinetics – Absorption, Distribution and excretion of drugs	A.S. Tsiftsoglou
6	Autonomous nervous system – Sympathetic and Parasympathetic	T. Sklaviadis
7	Parasympathomimetic and Parasympatholytic drugs	T. Sklaviadis
8	Nicotinic receptors stimulant drugs - Autonomic ganglia-blocking drugs - Skeletal muscle relaxant drugs	T. Sklaviadis
9	Sympathetic nervous system	T. Sklaviadis
10	Sympathomimetic and Sympatholytic drugs	T. Sklaviadis
11	Hormones of hypothalamus and pituitary gland (hypophysis) - Thyroid hormones and related drugs - Adrenal glands hormones and related drugs;	T. Sklaviadis
12	Estrogens - Androgens - Insulin - Vitamins	T. Sklaviadis
13	Pathophysiology of heart failure – Positive inotropic drugs	I.S. Vizirianakis
14	Pathophysiology of hypertension – Antihypertensive drugs	I.S. Vizirianakis
15	Clinical pharmacology of antihypertensive drugs – Drug selection upon prescription	I.S. Vizirianakis

16	Physiology of urine production (diuresis) and pathophysiology – Diuretic drugs	I.S. Vizirianakis
17	Clinical pharmacology of diuretic drugs – Drug selection upon prescription	I.S. Vizirianakis
18	Vasodilating agents – Anti-angina drugs	I.S. Vizirianakis

B) **Laboratory work**

Laboratory	**Title**	**Tutor**
1	Genomic DNA isolation from cultured cells and electrophoretic analysis: Study of drug actions	I.S. Vizirianakis
2	Drugs affecting autonomous nervous system: Experimentation with an isolated part of rabbit intestinal tract	A.S. Tsiftsoglou
3	Electrophoretic analysis of protein drug receptors	T. Sklaviadis
4	Animation experiment: vital organ parameters evaluation by using the "Anaesthetized Cat Program"	T. Sklaviadis

C) **Tutorials**

Tutorial	**Title**	**Tutor**
1	Basic pharmacokinetic principles	A.S. Tsiftsoglou
2	Pharmacology, Pharmacogenomics and new drug development era	I.S. Vizirianakis
3	Anti- atherosclerotic and anti-hypercholesterolemia drugs	T. Sklaviadis
4	Drug-receptor interactions and their impact on pharmacological effects	A.S. Tsiftsoglou

PHARMACEUTICAL CHEMISTRY I

Code number: 48

Cycle: Undergraduate

Semester: 5th

Course type

X	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 6.5

Lectures (hours/week): 3

Tutorial (hours/week): -

Laboratory work (hours/week): 2

Course coordinator: Athina Geronikaki, professor

Tutor (s):
Athina Geronikaki, professor
Room 414, 411, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: geronik@pharm.auth.gr

Eleni A. Rekka, professor
Room 409, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: email (rekka@pharm.auth.gr)

Assisting personnel: One technician (the same person for all the students and all laboratory work in pharmaceutical chemistry, i.e. about 300 students per semester).

Aims of the course: The aim of this course is to act as an introduction to chemistry of vitamins as well as to the specific pharmaceutical - medicinal chemistry courses, to teach the causes of pathologic conditions and general properties of vitamins and drug molecules. Other aims are to present some important characteristics of drugs such as selectivity and the role of various chemical bonds developed in drug action. An important aim is the transfer of a sound knowledge of role of xenobiotics and vitamins in human organism as well as drug metabolism and the consequences on drug action and toxicity. Also important are the issues of the pharmacodynamic and chemotherapeutic drugs as a concept, general anaesthetics, as well as the chemical and molecular aspects of drug - drug and drug - food interactions.

Skills: By the end of this course, the students should be able to:
Know the basic classification and causes of important diseases;
Know the characteristics of vitamins as well as of pharmacodynamic and chemotherapeutic drugs;
Know the characteristics of a satisfactory drug molecule, such as selectivity, potency, toxicity;
Have a good knowledge of the fate of a drug, including vitamins, in the body, its kinetics and, most important, its metabolism, as well as the phenomenon of xenobiotic metabolism from various aspects;
Know the formation of various types of chemical bonds and the effects on the development of drug action;
Have a good knowledge of the molecular and chemical basis of drug interactions.

Teaching methods: Lectures and laboratory work. The material is covered by textnotes and laboratory notes.

Contents of the course: Introduction . Pharmacochemical studies of vitamins. Synthesis/isolation, properties, action, structure-activity relationships usage of water soluble vitamins (ascorbic acid, thiamine, pantotenic acid, folic acid, vitamin B6, biotin, cyanocobalamine), oil soluble vitamins (retinols, vitamins D,E and K). Hyper/ hypovitaminosis of lipid soluble vitamins (retinols, calciferols, tocopherols, vitamin K) Consequences of interactions.
A chemical introduction on drug action and xenobiotic behaviour. Impact of drugs on health and disease. Differences and similarities between food and drugs.
General characteristics of drug molecules-Xenobiotics. General anaesthetics. Chemical bonds, drug properties and drug action. Covalent,

coordinated bonds, coulombic forces, hydrogen bond, van der Waals forces, lipophilic interactions.
Principles of selectivity based on differences in cytology, biochemistry and distribution.
Ways of drug loss, elements of drug absorption, distribution and excretion. Drug metabolism. Objectives, evolution, site, chemical nature of structural changes. Oxidations, reductions, hydrolyses and other phase I biotransformations. Conjugations with glucuronic acid, glycine, sulphate, glutathione, and other phase II biotransformations. Structure and function of cytochromes P450. P450 induction and inhibition. Biodetoxication, Biotoxication. Drug metabolism and drug stereochemistry.
Molecular aspects of drug-drug and drug-food interactions. Consequences of interactions, applications in therapy, elements of drug design and development.

Proposed literature:

1. R.S.Harris and K.V.Thimann, Eds. Vitamins and Hormones Vol.1-46, New York, Academic Press, 1943-1991.
2. R.J.Kutsky, Handbook of Vitamins and Hormones. 2nd ed. New York, Van Nostrand Reinhold, 1981.
3. R.B. Silverman "The Organic Chemistry of Drug Design and Drug Action", 2nd ed., 2004, Academic Press.
4. J.P. Uetrecht, W. Trager "Drug Metabolism: Chemical and Enzymatic Aspects: Textbook Edition", 2007, Informa Healthcare.

Educational activities: Lectures, discussion with the students in every lecture, problem solving and practical work in the laboratory.

Evaluation process and methods: Written examination at the end of the semester. The evaluation process is based on questions that the students are asked to answer based on their knowledge obtained from the lectures as well as on the critical thinking and ability to combine, evaluate and handle the acquired knowledge and information.
The duration of the examination is 3 hours.
The examination at the end of the semester is performed at dates, time and place arranged by the department.
During the laboratory work, students hand over a report of their results and are evaluated. At the end of the laboratory work, there is a written examination on this. Successful termination of the laboratory course permits their participation to the final examination.
At the examination of the course, each tutor gives out separate exam forms. To compute the final grade, the grade given by each tutor is randomly varied each exam period.

Final grade is calculated by addition of the course exam grade (80%) and the lab grade (20%).
Example: Supposing a course, where tutor A gives 60% of the grade in a given exam period and tutor B 40%, the final grade is calculated by the following formula:

$$F.G.= 0.8(a+b) +0.2c,$$

Where, a the grade given by tutor A (in a scale of 0-6), b the grade given by tutor B (in a scale of 0-4), c the lab grade (the average of the lab book grade and the lab exam grade).

Use of ΤΠΕ / Electronic distribution of the lectures
For course of vitamins TPE (Power Point presentation) is used.

Teaching: Teaching of this course is accomplished through lectures and laboratory work.

A) **Lectures**. Lectures (39 total, 3 hours per week) are given in the lecture room I3 (this is a room of limited capacity) and Δ12 (this is a room of limited capacity, located in a different building).

Lecture	Title	Tutor
1-3	Introduction. Antioxidant activity of vitamins. Aliphatic vitatmins (ascorbic acid). Derivatives of β-aminoacids (pantothenic acid, pangamic acid). Choline Chloride	A. Geronikaki
4-6	Unsaturated acids (linetol). Alicyclic vitamins (inositol, retinols, vitamin A and D)	A. Geronikaki
7-10	Aromatic vitamins (derivatives of naphthoquinones, vitamins K, antivitamins, dicoumarol and derivatives) Heterocyclic vitamins (Vitamin E) .	A. Geronikaki
11-15	Vitamins of heterocyclic class (lipoic acid). Bioflavonoids (vitamins P, routin). Nicotinic acid, nicotinamide . Vitamin B_6	A. Geronikaki
16-17	Pyridoxine Hydrochloride, Vitamin B_1	A. Geronikaki
18-19	Pterinic vitamins (folic acid) Biotin. Riboflavines.	A. Geronikaki
20	Cobalamines (vitamin B_{12}, hydroxicobalamine , cobamide). Orotic acid, vitamin U.	A. Geronikaki
21	Chemical aspects of drug action and xenobiotic behaviour. Differences and similarities between food and drugs.	E. Rekka

22-25	General characteristics of drug molecules-Xenobiotics. General anaesthetics. Chemical bonds, drug properties and drug action. Covalent, coordinated bonds, coulombic forces, hydrogen bond, van der Waals forces, lipophilic interactions.	E. Rekka
26-29	Principles of selectivity based on differences in cytology, biochemistry and distribution. Examples from drugs, explanation of their mode of action.	E. Rekka
30-32	Xenobiotic metabolism: Oxidations, reductions, hydrolyses and other phase I biotransformations.	E. Rekka
33-35	Xenobiotic metabolism: Conjugations with glucuronic acid, glycine, sulphate, glutathione, and other phase II biotransformations. Structure and function of cytochromes P450. P450 induction and inhibition.	E. Rekka
36-37	Biodetoxication, Biotoxication. Drug metabolism and drug stereochemistry.	E. Rekka
38-39	Molecular aspects of drug-drug and drug-food interactions, applications. Review exercises.	E. Rekka

C) Laboratory work
Students must perform laboratory work (2 hours per week).
ATTENTION! The students who want to attend the lab have to fill out a participation form before the beginning of the semester at the Laboratory of Pharmaceutical Chemistry. There is an announcement, calling students to fill out the participation forms at the announcement board of the Laboratory of Pharmaceutical Chemistry.

Laboratory	**Title**	**Tutor**
1-3	Synthesis of aspirin	A. Geronikaki
4-5	Detection of N, S and Cl in organic compounds	A. Geronikaki
6-7	Quantitative determination of aspirin	A. Geronikaki
8-9	Quantitative determination of ascorbic acid	A. Geronikaki
10-11	Quantitative determination of ephedrine	A. Geronikaki
12-13	Thin Layer Chromatography of common drugs	A. Geronikaki

SEMESTER VI

ORGANIC PHARMACEUTICAL CHEMISTRY II

Code number: 54

Cycle: Undergraduate

Semester: 6th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 5.5

Lectures (hours/week): 3

Tutorial (hours/week): -

Laboratory work (hours/week): 2

Course coordinator: Vasilis Demopoulos, professor

Tutors:
1) Vassilis Demopoulos, professor
Room 408A & 409B, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 1-2 pm.
Communication: e-mail (vdem@pharm.auth.gr)

2) Ioannis Nicolaou, lecturer
Room 404, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 12-1 pm.
Communication: e-mail (inikolao@pharm.auth.gr)

3) Dimitra Hadjipavlou-Litina, professor
Room 408/B & 410, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 11-12 am.
Communication: e-mail (hadjipav@pharm.auth.gr)

Assisting personnel: Dr. Antony Gavalas,

Aims of the course:

-Relationships between chemical structure & physicochemical properties with the activity of drug molecules.
-Molecular & chemical mode of action of drug molecules.
-Chemical stability of drug molecules.
-Biotransformatinos of xenobaiotics.
-Representative synthetic strategies and chemical quantitative identification of drug molecules.

Skills:
-Practical implementation of the following types of reactions:
a) oxidative modification, *b)* double nucleophilic attack on carbonyls, *c)* intramolecular rearrangement of a phenyl moiety, & *d)* thermodynamic formation of a heterocyclic ring under anhydrous conditions.
-Gradual changes of the pH of the milieu aiming to the purification of organic drug molecules.
-Identification/explanation of the fingerprint of drug molecules in the ^{1}H-NMR spectrum.
-Chemical oxido-reductive quantitative identification of drug molecule.

Teaching methods:
Lectures, theoretical and practical laboratory work.

Contents of the course:
1) Vassilis Demopoulos
Synthetic strategy, source identification-isolation, structural elucidation, analysis, molecular mechanism of action, selectivity, stability and bio-transformations for the following classes of drug molecules: antibacterial agents, antifungal agents, antiviral agents, diuretics, histamine receptor (H1 & H2) agonists and antagonists, non steroidal anti-inflammatory drugs (NSAIDs), drugs for the gout and rheumatoid arthritis (DMADs), introductive molecular modeling and statistical computational approaches.
2) Ioannis Nicolaou
Pharmacochemical approach (as design, synthesis, physicochemical properties, target cell interactions, structure-activity relationships, pharmacochemical interpretation of toxicity, metabolism) of the below classes of drugs: antineoplastics & antineoplastic detoxifying agents, antidiabetic agents & agents for the treatment of obesity, renin inhibitors-angiotensin converting enzyme inhibitors & angiotensin II inhibitors, calcium channel blocking agents, nitrates (for the treatment of angina), platelet aggregation inhibitors, coumarins as anticoagulant, local anesthetics.
3) Dimitra Hadjipavlou-Litina
Synthetic strategy-structural characterization-analysis-molecular mechanism of action, structure activity-relationships, selectivity, pharmacochemical aspect of activity and metabolism in the human organism of the following groups of drugs: acetyl-choline's agonists and antagonists, inhibitors of acetyl-cholinesterase, anti-alzheimer, hybrid molecules, polotic and

apopolotic agents, sympathomimetics (α- & β- receptor agonists), sympatholytics (α- & β- receptors antagonists), inhibitors of lipoxygenase.

Proposed literature:

1) Vasilis Demopoulos

- Richard B. Silverman "The Organic Chemistry of Drug Design and Drug Action", Academic Press, 2004, ISBN-10: 0126437327
- Annual Reports in Medicinal Chemistry, http://www.sciencedirect.com/science/bookseries/00657743
- Joseph J. Cannon "Pharmacology for Chemists", Oxford University Press, 2007, ISBN-10: 0841239274
- E. J. Corey, B. Czako, L. Kurti "Molecules and Medicine", Wiley, 2007, ISBN-10: 0470227494

2) Ioannis Nicolaou

- *Journal* of Medicinal *Chemistry* (ACS Publications)
- *Bioorganic & Medicinal Chemistry Letters* - Elsevier
- *Bioorganic & Medicinal Chemistry* (ISSN 0968-0896)
- The *Journal* of Biological *Chemistry*
- *Chemical* Research in *Toxicology* (ACS Publications)
- *Drug Metabolism and Disposition*

3) Dimitra Hadjipavlou-Litina

- Medicinal Chemistry Principles and Practice, Ed. F.D.King. 1994, The Royal Society of Chemistry, ISBN 0-85186-494-5
- Contemporary Drug Synthesis Li J.J, Johnson D., Sliskovic D., Roth B. Wiley-Interscience,2004, ISBN 0-471-21480-9
- New Trends in Synthetic Medicinal Chemistry, Ed. F. Gualtieri, Wiley –VCH, Vol. 7, 2000
- Annual Reports in Medicinal Chemistry, Academic Press
- *Journal* of Medicinal *Chemistry* (ACS Publications)
- *Bioorganic & Medicinal Chemistry Letters* - Elsevier
- *Bioorganic & Medicinal Chemistry* (ISSN 0968-0896)
- "Practical Pharmaceutical Chemistry part I, II) The Athlone Press 1975
- "Principles of Medicinal Chemistry" W.O. Foye, ed. Lea & Febiger, 1995
- "Remington's Pharmaceutical Sciences", Osol A. ed. Mack Publishing Co., 1980
- « Goodman & Gilman's The Pharmacological Basis of Therapeutics » Goodman a., Hardman J., Limbird L., eds MacMillan Publishing Co 2001
- "Strategies for Organic Drug Synthesis and Design" Lednicer, D., ed. Wiley J. & Sons 2000

- ”Essentials of Pharmacology” Theocharidis T. Little, Brown & Company 2nd edition, 1999
- Drug Actions, Basic Principles and Therapeutic Aspects, Mutschler/Devendorf
- Archiv.Pharm 317, 183-185, 1984
- Arch Pharm 325, 483-90, 1992.
- Arch Pharm 328, 689-698, 1995
- Intensive Care Med. 18, 449-454, 1992
- Greenblatt et al. (1999) FEBS Letters **463**, p321
- Dvir et al. (2003) JACS **125**, p363
- Bar-On et al. (2002) Biochemistry **41**, p3555.
- Kryeger et al.,(1997) Structure 7,297
- Raves et al. (1997) Nature Structural Biology 4, p57
- Εθνικό Συνταγολόγιο 2007, Εθνικός Οργανισμός Φαρμάκων

Educational activities:
Lectures, discussion with the students in every lecture.

Evaluation process and methods:
The evaluation of knowledge and skills which have been acquitted by the students from the course work is attested with written examinations (80% of the final grade + 20% of experimental aptitude) which are conducted in a fixed date. The written examinations have duration of 3.5h, and consist of approximately ten (10) composite questions spherically covering the tough subjects. Grading is proportionally allocated to the tutors. Optional periodic examinations, partially covering the tough subject, could be also arranged between tutors and students.

Use of TIC / Electronic distribution of the lectures:
Tutors:
1) Vassilis Demopoulos, professor
Lectures:

The haptics (http://www.telegraph.co.uk/education/educationnews/8271656/Write-it-dont-type-it-if-you-want-knowledge-to-stick.html) approach is used

2) Ioannis Nicolaou
Lectures, notes, statements etc are presented in the corresponding place of the website of the School of Pharmacy.

3) Dimitra Hadjipavlou-Litina, professor
Lectures, notes, statements etc are presented in the corresponding place of the website of the School of Pharmacy.

Teaching

Teaching of this course is accomplished through lectures, special supportive lectures and laboratory work.
A total of 39 lectures (13 weeks x 3 hours) are given in the lecture room Δ12 implementing power point projection and/or overhead projection, as well as with chalk and a blackboard.

α) Lectures:

Lecture	**Title**	**Tutor**
1	Chemotherapeutic drugs, selective toxicity, antibacterial antibiotics, penicillins, structural and physicochemical aspects in their molecular mechanism of action	**V. Demopoulos**
2-3	Synthetic strategy towards benzylpenicillin, carbenicillin, & ampicillin	**V. Demopoulos**
4	Cephalosporins, structural/functional characteristics & activity, semisynthetic preparation of 7-ACA	**V. Demopoulos**
5-6	Various antibacterial antibiotics with molecular focusing on monobactams, chloramphenicol, cycloserine, tetracyclines, aminoglycosides & macrolides	**V. Demopoulos**
7-9	Non-antibiotic antibacterial drugs with molecular focusinh on isoniazide, metronidazole, nitrofuradoine, sulfanilamides and quinolones	**V. Demopoulos**
10	Antifugal phenacylimidazoles. Antiiviral chemotherapeutics with focus on acyclovir	**V. Demopoulos**
11-13	Non-steroidal anti-inflammatory drugs, chemical biology of their pharmacodynamic and pharmacokinetic behavior, methods of sustainable	**V. Demopoulos**

	preparation & physicochemical identification	
14-15	Diouretics, chemical biology of their pharmacodynamic and pharmacokinetic behavior, synthetic strategy & physicochemical identification	**V. Demopoulos**
16	Physicochemical properties and selectivity of histamine receptor ligands	**V. Demopoulos**
17-20	Antineoplastics & antineoplastic detoxifying agents	**I. Nicolaou**
21-23	Antidiabetic agents & agents for the treatment of obesity	**I. Nicolaou**
24	Renin inhibitors-angiotensin converting enzyme inhibitors & angiotensin II inhibitors	**I. Nicolaou**
25	Calcium channel blocking agents & nitrates (for the treatment of angina)	**I. Nicolaou**
26	Platelet aggregation inhibitors & coumarins as anticoagulant	**I. Nicolaou**
27	Local anesthetics	**I. Nicolaou**
28-29	Peripheral Nervous System-Cholinergics- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**
30-32	Acetylocholine antagonists-Inhibitors of Achetylcholinesterase-Organophosphoric esters-Antiglavcoma agents- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**
33	Acetyl-choline antagonists -- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**

34	Anti-Alzheimer drugs- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**
35-36	Adrenergics- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**
37	Agonists of α -receptors- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**
	Sympathomimetic amines- Aliphatic adrenergic amines- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**
38	Antagonists of α- and β-receptors- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**
39	Inhibitors of Lipoxygenase- Synthetic Strategy & structure activity relationships	**D.Hadjipavlou-Litina**

b) Laboratory Work:
Students are notified on February of each year to enroll for laboratory work. Students who neglect to enroll in time will perform the laboratory work next proper semester.

Laboratory	**Title**	**Tutors**
1-4	First step reaction in the synthesis of phenytoin and isolation of crude benzil	**V. Demopoulos, D.Hadjipavlou-Litina, I. Nicolaou**
5-8	Drying/weighting of benzil. Implementation of spectrometric methods in identification of specific organic molecules	**V. Demopoulos, D.Hadjipavlou-Litina, I. Nicolaou**
9-11	Second step reaction in the preparation of phenytoin	**V. Demopoulos, D.Hadjipavlou-**

		Litina, I. Nicolaou
12-15	Isolation/purification, drying/weighing & identification of phenytoin	**V. Demopoulos, D.Hadjipavlou-Litina, I. Nicolaou**
16-18	Reaction for the preparation of hymechromone under anhydrous conditions	**V. Demopoulos, D.Hadjipavlou-Litina, I. Nicolaou**
19-22	Isolation/purification, drying/weighing & identification of hymechromone	**V. Demopoulos, D.Hadjipavlou-Litina, I. Nicolaou**
23-26	Chemical quantitative analysis of hydralazine hydrochloride	**V. Demopoulos, D.Hadjipavlou-Litina, I. Nicolaou**

PHARMACOLOGY II
Code number: 55

Cycle: UNDERGRADUATE

Semester: 6th

Course type

	Background/General knowledge

X	Scientific area (pharmacy)

Credit Units (ECTS): 5.5

Lectures (hours/week): 3

Tutorial (hours/week): 1

Laboratory work (hours/week): 2

Course coordinator: Asterios S. Tsiftsoglou

Tutors in lectures:

1. Asterios S. Tsiftsoglou, Professor
2. Ioannis S. Vizirianakis, Associate Professor

Tutors in laboratory exercises:

1. Asterios S. Tsiftsoglou, Professor
2. Ioannis S. Vizirianakis, Associate Professor
3. Lefkothea C. Papadopoulou, Assistant Professor

Assisting personnel:

4. Ioannis Bonovolias, M.Sc., Postdoctoral fellow
5. Elsa Amanatiadou, M.Sc., Predoctoral fellow

Aims of the course:

To introduce undergraduate students of Pharmacy into the basic principles of Pharmacology; the pharmacodynamics and pharmacokinetics parameters of drugs; the various classes of medicines; the mechanism underlying their actions in the human body; the factors contributing to pharmacological response; the emergence of adverse drug reactions (ADRs); possible drug-drug interactions; drug dosage scheme selection upon drug prescription and drug delivery in clinical practice. Emphasis is given on medicines acting on CNS and on chemotherapeutics for microbial, viral infections as well as neoplastic diseases. Part of these courses cover the therapy of hematopoietic and immune disorders as well as biopharmaceutics and several others (see below).

Skills:

Lectures, tutorials and laboratory tests

Teaching methods:

Lecture presentations, Computer-Assisted Learning in Pharmacology (PCAL), Tutorials, and Discussion of specific drug-related case studies

Contents of the course:
Introduction to Central Nervous System (CNS) pharmacology; Anti-parkinsonism drugs; Opioid analgesics; CNS depressant agents; Barbiturates; Antidepressant drugs; Antianxiety agents; Psychotropics; Anti-psychotropic drugs; Psycho-stimulants; Alcohols; Non-opiod analgesics; NSAIDs; Antigout and anti- hyperuricaemia drugs; Anemias; Iron pharmacology; Vitamin B12; Folic acid; Antiemetic drugs; Expectorant agents; Antacids; Antidiarrhoeals; Laxatives; Antineoplastic agents; Antimicrobial drugs; Antituberculosis drugs; Antifungal drugs; Disinfectants; Antiseptics; Immunosuppressive drugs; Serum; Vaccines; Antibodies; Plasma clot mechanisms; Anticoagulant (anticlotting) agents;

Proposed literature:
Textbooks written in Greek and English as well as pharmaceutical journals

Educational activities:

Evaluation process and methods:
Written exams at the end of the semester; essay submission in laboratory tests

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures
PowerPoint slides, computer use, PCAL CD-ROMs, videos. The lectures of Assoc. Prof. I.S. Vizirianakis are available in PDF format to students in the homepage of "e-Class AUTh" (www.e-class.auth.gr)

Teaching:

E) **Lectures**

Lecture	**Title**	**Tutor**
1	Introduction to Central Nervous System (CNS) pharmacology – Anti-parkinsonism drugs	A.S. Tsiftsoglou
2	Opioid analgesics	A.S. Tsiftsoglou
3	CNS depressant agents - Barbiturates	A.S. Tsiftsoglou
4	Antidepressant drugs and antianxiety agents	I.S. Vizirianakis
5	Psychotropics - anti-psychotropic drugs	I.S. Vizirianakis

6	Psycho-stimulants - Alcohols	A.S. Tsiftsoglou
7	Non-opiod analgesics - NSAIDs - Antigout and anti- hyperuricaemia drugs	I.S. Vizirianakis
8	Anemias – Iron pharmacology – Vitamin B12 - Folic acid	A.S. Tsiftsoglou
9	Chemotherapy I	A.S. Tsiftsoglou
10	Chemotherapy II	A.S. Tsiftsoglou
11	Chemotherapy III	I.S. Vizirianakis
12	Chemotherapy IV	I.S. Vizirianakis
13	Chemotherapy V	I.S. Vizirianakis
14	Immunosuppressive drugs	I.S. Vizirianakis
15	Serum - Vaccines - Antibodies	A.S. Tsiftsoglou
16	Plasma clot mechanisms – Anticoagulant (anticlotting) agents	A.S. Tsiftsoglou

B) **Laboratory work**

Laboratory	**Title**	**Tutor**
1	Evaluation of cytotoxic activity of antineoplastic chemotherapeutic drugs by using leukemic cell cultures	I.S. Vizirianakis
2	Measurement of prothrombin time and partial thromboplastin time in plasma	L. Papadopoulou
3	Assessment of sensitivity or resistance of microbes to antibacterial antibiotics (antibiogram)	A.S. Tsiftsoglou
4	Genotyping and mapping analysis of specific DNA fragments for pharmacogenomics applications	I.S. Vizirianakis

C) **Tutorials**

Tutorial	Title	Tutor
1	Cancer pharmacogenomics	I.S. Vizirianakis
2	Pharmacovigilance: The case of NSAIDs	I.S. Vizirianakis
3	Chemotherapy of microbial and viral infections	A.S. Tsiftsoglou
4	Addiction and drug dependence (Opioids)	A.S. Tsiftsoglou

FIRST AID
Code number: NP48

Cycle: Undergraduate(Optional)

Semester: 6th

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): 2

Course coordinator:
D. Vasilakos, Professor

Tutor (s):
D. Vasilakos, Professor

Assisting personnel:

Aims of the course:

Skills:

Teaching methods:

Lectures & laboratory exercises '.

Contents of the course: To rescue and correct placement of patients who need emergency care. Endotracheial intubation. Trachea, or first aid. Shock. First aid for heart-circulatory disorders. First aid in multiple traumas. Haemoostasis. First aid in thorax trauma. Skull and brain lesions. First aid for burns.Poisoning.Heart and lung rejuvenation in adults and children.

Proposed literature:

Educational activities:

Evaluation process and methods: Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

BIOINFORMATICS
Code number: NP47

Cycle: Undergraduate

Semester: 6th

Course type

x	Background/General knowledge
	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2 weeks

Tutorial (hours/week): ***2 weeks***

Laboratory work (hours/week):

Course coordinator:

Tutor (s):Zacharia Skouras ,Professor(Faculty of Biology)

Assisting personnel: Zacharias Skouras (Coordintor)

7.09, 7th floor office building Biology/Pharmacy
Contact: by email (scouras@bio.auth.gr)

2) Elias Kappas, Lecturer

7.05, 7th floor office building Biology/Pharmacy
Cooperation with students: daily 10.00-13.00
Contact: by email (ikappas@bio.auth.gr)

3) Spyros Gkelis, Lecturer

9.21, 9th floor office building Biology/Pharmacy
Cooperation with students: daily 11.00-13.00
Contact: by email (sgkelis@bio.auth.gr)

Aims of the course:

Training in computer applications on organizing and understanding of biological information. Familiarity with the management, control and analysis of molecular data, in particular with a view to extracting biological conclusions

Skills:

Acquisition of capacity use of the numerous biological information databases through the Internet. Familiarization with recovery tools, comparison and analysis of biological information. Familiarity with the use of computer programs and Internet servers to find the bond, sequences and genome analysis, determining 3D macromolecules. Introduction to molecular evolution models.

Teaching methods:

During the lectures, exercises,tutorials

Contents of the course:

Categories: genetic markers and molecular information. Definition, design and structure of a database. Search strategies. Analysis and evaluation of search results. Prediction of protein structures. Analysis patterns. Determination of 3D structure. Alignment and find bond sequences. Models of evolution.Pharmacodynamicsi. Molecular diagnosis. Future developments in Bioinformatics and computational biology.

Proposed literature:

Baxevanis, A.D. and Ouellette, F. (Greek version). 2004. Bioinformatics. Scientific Editions Parisianou S.a. Athens (edited by Greek version: Evangelos n. Moudrianakis, Stavros j. Chamodrakas).

Educational activities:

Monitoring of lectures,Working on different projects, Collaboration in teams

Evaluation process and methods:
Written Examination, Written Tasks

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

The lectures of the course made use of ICT/course material available on Blackboard

Teaching:

The teaching of the course are lectures, written exercises and tutorials

A) **Lectures**.
The lectures (2 hours) take place once a week in room D12 and use electronic media to view the lectures. Copies of lectures and posted on the website of the course (Blackboard) by free access.

Lecture	**Title**	**Tutor**
1	Genetic markers – Molecular information	Z.Skouras, E.Kappas.
2	Introduction to bioinformatics	E.Kappas.
3	Databases – Search Strategies (1)	E.Kappas.
4	. Databases – Search Strategies (2	E.Kappas.
5	Analysis of DNA and amino acid sequences	E.Kappas.
6	Protein databases	E.Kappas.
7	Aligning sequences	S.Gkelis
8	Molecular Evolution (1)	E.Kappas.
9	Molecular Evolution (2)	S.Gkelis
10	Polymorfisms single nucleotide and pharmacodynamics	E.Kappas.
11	Molecular diagnosis	E.Kappas.
12	Applications of bioinformatics	S.Gkelis

13	Future developments in Bioinformatics and computational biology	Z.Skouras, E.Kappas.

SEMESTER VII

ORGANIC PHARMACEUTICAL CHEMISTRY III

Code number: 70
Cycle: Undergraduate
Semester: 7th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 8
Lectures (hours/week): 3
Tutorial (hours):

Laboratory (hours): 2

Course Coordinator:
Dimitra Hadjipavlou-Litina, professor

Tutors:
1) **Eleni A. Rekka, professor**
Room 409, 4th froor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: email (rekka@pharm.auth.gr)

2) **Ioannis Nicolaou**, **Lecturer**
Room 404, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 12-1.
Communication: email (inikolao@pharm.auth.gr)

3) **Dimitra Hadjipavlou-Litina, Professor**
Room 408/B & 410, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 11-12.
Communication: e-mail (hadjipav@pharm.auth.gr)

Assisting Personnel:
Dr A. Gavalas

Aims of the course: This course is concerned with the discovery, design, synthesis and identification of biologically active compounds acting on the central nervous system (CNS), antiepileptics drugs: miscellaneous anticonvulsants, miscellaneous antiparkinson agents, NMDA receptor antagonists for the treatment of Alzheimer's disease, antimigraine agents, agonists/antagonists of Adenosine, Inhibitors of adenyl-cyclase- Inhibitors of PDEs, Methylphenidate and analogues, Inhibitors of serineproteases, Statines, Agonists/Antagonists of CCK. Quantitative structure-activity relationships (SAR/QSAR). Finally, agents used illegally, such as opioids, cannabinoids and other drugs of addiction, with special pharmaco-sociologic interest, are studied.

Aims are the critical knowledge and thorough examination of synthesis, structure, correlation of structure with drug action, fate of the drugs in the organism, sites of loss, therefore duration of drug action. Aim is also to familiarise the students with relations governing molecules acting on CNS and the central nervous system site of action, as well as the involved neurotransmitters.

Scills: By the end of this course, the students should be able to: Know the synthesis of the important drug molecules used for pathologic conditions concerning CNS and cardiovascular system, the physical and chemical properties of these drugs, the biological properties that give the therapeutic potential to these groups of drugs, the structural changes (i.e. metabolism) and fate of these molecules in the organism, the duration of action, the possibility of biodetoxication or biotoxication. Reach conclusions on the relationships between action and structural and physicochemical characteristics and examples are studied of characteristic molecules used illegally as narcotic and addictive agents, from the pharmacochemical point of view.

Teaching methods: Lectures and laboratory work. The material is covered by a textbook, text notes and laboratory notes.

Contents of the course:
1) Eleni A. Rekka

This course analyses synthetic pathways, extraction-isolation, physical, chemical, biological properties, purity and quality control, identification, quantitative determination, molecular mode of action, side effects, fate in the organism - drug metabolism, structure-activity relationships, therapeutic uses, adverse actions and doses of drugs acting on the Central Nervous System, i.e. hypnotics, anxiolytics, neuroleptics (drugs acting against mania and psychoses), antidepressants. Opioids and other centrally acting analgesic and antitussive agents. Opioid antagonists. Introduction to addiction. Agents used in detoxication and addiction therapy. Cannabinoids, psychotoxic and psychedelic drugs.

2) Ioannis Nicolaou
Pharmacochemical approach (as design, synthesis, physicochemical properties, target cell interactions, structure-activity relationships, pharmacochemical interpretation of toxicity, metabolism) of the below classes of drugs: miscellaneous anticonvulsants, miscellaneous antiparkinson agents, NMDA receptor antagonists for the treatment of Alzheimer's disease, antimigraine agents.

3) Dimitra Hadjipavlou-Litina
Stimulants-Analeptics -Agonists/antagonists of Adenosine, Inhibitors of adenyl-cyclase- Inhibitors of PDEs, Methylphenidate and analogues, Inhibitors of serineproteases, Statines, Agonists/Antagonists of CCK. Quantitative structure activity relationships (SAR/QSAR). Examples of Quantitative structure activity relationshipsdetermination and chemical identifications.

Proposed Literature:

1) Eleni A. Rekka

- A. Korolkovas, "Essentials of Medicinal Chemistry", Wiley International Publications, John Wiley & Sons, 2003.
- J.M. Beale, J. Block, "Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry", Lippincott Williams & Wilkins; 12th ed., 2010

2) Ionnis Nicolaou

- ***Journal* of Medicinal *Chemistry* (ACS Publications)**
- ***Bioorganic & Medicinal Chemistry Letters* - Elsevier**
- ***Bioorganic & Medicinal Chemistry* (ISSN 0968-0896)**
- **The *Journal* of Biological *Chemistry***
- ***Chemical* Research in *Toxicology* (ACS Publications)**
- ***Drug Metabolism and Disposition***

3) D.Hadjipavlou-Litina

- Medicinal Chemistry Principles and Practice, Ed. F.D.King. 1994, The Royal Society of Chemistry, ISBN 0-85186-494-5
- Contemporary Drug Synthesis Li J.J, Johnson D., Sliskovic D., Roth B. Wiley-Interscience,2004, ISBN 0-471-21480-9
- New Trends in Synthetic Medicinal Chemistry, Ed. F. Gualtieri, Wiley –VCH, Vol. 7, 2000
- Annual Reports in Medicinal Chemistry, Academic Press

- ***Journal* of Medicinal *Chemistry* (ACS Publications)**

- ***Bioorganic & Medicinal Chemistry Letters* - Elsevier**

- *Bioorganic & Medicinal Chemistry* (ISSN 0968-0896)
- "Practical Pharmaceutical Chemistry part I, II) The Athlone Press 1975
- "Principles of Medicinal Chemistry" W.O. Foye, ed. Lea & Febiger, 1995
- "Remington's Pharmaceutical Sciences", Osol A. ed. Mack Publishing Co., 1980
- « Goodman & Gilman's The Pharmacological Basis of Therapeutics » Goodman a., Hardman J., Limbird L., eds MacMillan Publishing Co 2001
- "Strategies for Organic Drug Synthesis and Design" Lednicer, D., ed. Wiley J. & Sons 2000
- "Essentials of Pharmacology" Theocharidis T. Little, Brown & Company 2nd edition, 1999
- Drug Actions, Basic Principles and Therapeutic Aspects, Mutschler/Devendorf
- Archiv.Pharm 317, 183-185, 1984
- Arch Pharm 325, 483-90, 1992.
- Arch Pharm 328, 689-698, 1995
- Intensive Care Med. 18, 449-454, 1992
- Greenblatt et al. (1999) FEBS Letters **463**, p321
- Dvir et al. (2003) JACS **125**, p363
- Bar-On et al. (2002) Biochemistry **41**, p3555.
- Kryeger et al.,(1997) Structure 7,297
- Raves et al. (1997) Nature Structural Biology 4, p57

- National Formulary 2007, National Organization of Drugs

Educational Activities

Lectures, discussion with the students in every lecture, laboratory work and tutorials.

Evaluation process and methods:

Examination of the course can be done either by successful participation in two written mid-term exams (grade ≥5 in each mid-term exam) of by a final written examination at the end of the semester. Student eligibility to participate in the mid-term exams is gained by regular attendance of the lectures throughout the semester**.** The evaluation process is based on questions that the students are asked to answer based on their knowledge obtained from the lectures as well as on the critical thinking and ability to combine, evaluate and handle the acquired knowledge and information.

The duration of the examination is 4 hours.

The examination at the end of the semester is performed at dates, time and place arranged by the department.

During the laboratory work, students hand over a report of their results and are evaluated. At the end of the laboratory work, there is a written

examination on this. Successful termination of the laboratory course permits their participation to the final examination.
To compute the final grade: the grade given by each tutor is taken (E. Rekka = 4.5/ D. Hadjipavlou-Litina = 3.5 /I. Nicolaou = 2.5) and the final grade is calculated by addition of the course exam grade (80%) and the lab exam grade (20%).

Use of TIC / Electronic distribution of the lectures:
Tutors:
1) Eleni A. Rekka, professor
Relevant announcements are presented in the corresponding place of the website of the School of Pharmacy.

2) Ioannis Nicolaou, Lecturer
Lectures, notes, statements etc are presented in the corresponding place of the website of the School of Pharmacy

3) Dimitra Hadjipavlou-Litina, professor
Lectures, notes, statements etc are presented in the corresponding place of the website of the School of Pharmacy

Teaching (Lectures/Laboratory work/ Tutorial)
In general: Lectures, discussion with the students in every lecture, in the classroom, review of basic knowledge and practical work in the laboratory. Supportive teaching and discussions are provided when needed.
Powerpoint presentation is used in the lectures, as well as slides and blackboard.

E. Rekka *(especially)*: Lectures, discussion with the students in every lecture, problem solving, homework and answers in the classroom, review of basic knowledge and practical work in the laboratory. Supportive teaching and discussions are provided when needed.
a) Lectures.
Lectures are given 3 hours per week (and additionally) in the lecture room D12 (located in the School of Natural Sciences)

Lecture	**Title**	**Tutors**
1	Hypnotics, Ethyl and methyl alcohols	E. Rekka
2-4	Neuroleptics-Phenothiazines, Butyrophenones, Newer	E. Rekka
5-7	Anxiolytics-Benzodiazepins, Newer	E. Rekka
8-10	Antidepressants-Tricyclic, Selective	E. Rekka

	serotonin reuptake inhibitors, Newer	
11-13	Morphinomimetics-Natural, Semisynthetic, Synthetic	E. Rekka
14	Centrally acting antitussives, Opioid antagonists	E. Rekka
15-16	Cannabinoids, Psychotropics	E. Rekka
17	Non-therapeutic use of drugs (opioids, cannabinoids, psychotropics) - Addiction - Drugs used for detoxication	E. Rekka
18-19	Analeptics- synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
20-22	Analeptics-Agonists/antagonists of adenosine synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
23-24	Analeptics-Agonists/antagonists of adenosine – Inhibitors of adenyl cyclase-synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
25-26	Inhibitors of PDEs- synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
27	Methylphenidate and analogues synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
28	Inhibitors of serinproteases - synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
29	Statins- synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
30-31	Agonist/antagonist of CCK- synthetic strategy and structure activity relationships	D. Hadjipavlou-Litina
32-35	Miscellaneous anticonvulsants	I. Nicolaou

36-38	Miscellaneous antiparkinson agents & NMDA receptor antagonists for the treatment of Alzheimer's disease	I. Nicolaou
39	Antimigraine agents	I. Nicolaou

b) Laboratory work
Students must do laboratory work (4 hours twice per week).
ATTENTION! The students who want to attend the lab have to fill out a participation form before the beginning of the semester at the Laboratory of Pharmaceutical Chemistry. There is an announcement, calling students to fill out the participation forms at the announcement board of the Laboratory of Pharmaceutical Chemistry. During the laboratory work, students report their results and are evaluated. At the end of the laboratory work, there is a written examination on this. Successful termination of the laboratory course permits their participation to the final examination.

Laboratory	**Title**	**Tutor(s)**
1-4	Synthesis of benzocaine	E. Rekka – D.Hadjipavlou-Litina- I. Nicolaou
5-6	Determination of saccharin sodium	E. Rekka - D.Hadjipavlou-Litina- I. Nicolaou
7-8	Determination of chlordiazepoxide hydrochloride	E. Rekka - D.Hadjipavlou-Litina- I. Nicolaou
9	Determination of nicotinamide	E. Rekka - D.Hadjipavlou-Litina- I. Nicolaou
10	Spectroscopic identification (IR spectroscopy) of benzocaine (labs. 1-4)	E. Rekka - D.Hadjipavlou-Litina- I. Nicolaou
11	Preparation and titration of standard solutions	E. Rekka - D.Hadjipavlou-Litina- I. Nicolaou
12	Digestive decomposition of organic compounds (for the determination of	E. Rekka - D.Hadjipavlou-

	nitrogen and chloride)	Litina- I. Nicolaou
13	Literature survey	E. Rekka - D.Hadjipavlou- Litina- I. Nicolaou

SPECIFIC PHARMACEUTICAL TECHNOLOGY II

Code number: MAF 71

Cycle : Undergraduate

Semester : 7th
Course Type

	Background/ General knowledge
x	Scientific Area (pharmacy)

Credit units (ECTS): 6

Lectures (hours per week): 3

Tutorial (hours per week):
Laboratory work (hours per week): 6

Course coordinator:
Stavros Malamataris , professor
Tutors :
1 . Stavros Malamataris, professor
Room 204, 2nd floor, Biology/Pharmacy building
Collaboration with students: every day
Communication : email (smalam@pharm.auth.gr)

2. Athanasia Panagopoulou, lecturer
Room 207, 2nd floor, Biology/Pharmacy building
Collaboration with students: every day
Communication: email (pathanas@pharm.auth.gr)
Assistant personal :

Aims of the course:
Education about the sterile dosage forms and the liquid non sterile dosage forms.
Skills :
The students learn how to work and use instruments that are used for the preparation and control of sterile pharmacological dosage forms and methods for the preparation of liquid non sterile dosage forms.

Teaching methods :
Lectures and laboratory work.

Contents of the course :
A . Sterile dosage forms: general information on microbes. Microbiological contamination of pharmaceutical products. Antimicrobial action of chemical substances. Sterilization of pharmaceutical products. Ophthalmic products. Injectable (parenteral) products. Production of water with pharmaceutical purity specifications.
B. Liquid dosage forms. Solutions of drugs for oral administration: general views. Water and other solvents. Auxiliary substances. Production of pharmaceutical solutions – Syrups – Elixirs. Pharmaceutical solutions prepared form extracts of pharmaceutical plants.

Proposed literature :
S. Malamataris. Technology of sterile liquid pharmaceutical dosage forms.
Th. Brousali. Liquid non sterile dosage forms.

Educational activities :
Lectures and laboratory work.

Evaluation process:
Written examinations at the end of the semester. The duration of the exams is 2 hours.
After the students finish their laboratory work, they prepare reports about their results.

Use of ΤΠΕ / electronic distribution of the lectures.

Power point presentation is used in the lectures.

Teaching .
Teaching is accomplished through lectures and laboratory work.
A . The lectures are taking place (one of 2h and the other of 1h) two times a week in the seminar room of the 2nd floor in the Biology/Pharmacy building.

Lecture	**Title**	**Tutor**
1	General information on microbes (1) Solubility and solvents	S.Malamataris A. Panagopoulou
2	General information on microbes (2) Co –solvents in pharmacy	S.Malamataris A. Panagopoulou
3	Microbiological contamination of pharmaceutical products. Physicochemical properties of pharmaceutical substances.Electrolytes.	S.Malamataris A. Panagopoulou
4	Antimicrobial action of chemical substances. Buffer solutions.	S.Malamataris A. Panagopoulou
5	Sterilization of pharmaceutical products. Solvents used for the preparation of liquid pharmacological dosage forms.	S.Malamataris A. Panagopoulou

6	Sterilization of pharmaceutical products (2) Auxiliary substances used for the improvement of pharmacological dosage forms.	S.Malamataris A. Panagopoulou
7	Laminar flow. Clean rooms.(1) Auxiliary substances used for the colorance of pharmaceutical dosage forms.	S.Malamataris A. Panagopoulou
8	Laminar flow. Clean rooms (2) Auxiliary substances used for the improvement of taste and odor.	S.Malamataris A. Panagopoulou
9	Preservation of pharmaceutical products. Preparation or solutions for per os administration.	S.Malamataris A. Panagopoulou
10	Ocular products. Syrups.	S.Malamataris A. Panagopoulou
11	injectibles (1). Elixirs.	S.Malamataris A. Panagopoulou
12	Injectibles (2). Tinctures.	S.Malamataris A. Panagopoulou
13	Production of water of pharmaceutical purity specifications. Fluid extracts.	S.Malamataris A. Panagopoulou

Γ) laboratory work.
Laboratory classes are held 3 times per week and the duration of each is 2 hours. They take place in the pharmaceutical technology department.

Lab	**Title**	**Tutors**
1	Measurement and control of the osmolarity or injectables and eye drops.	Panagopoulou
2	Practical training on pharmaceutical microbiology using interactive software.	Panagopoulou
3	Sterilization techniques and assessment of microbiological contamination.	Nikolakakis

SEMESTER VIII

ORGANIC- AND RADIO-PHARMACEUTICAL CHEMISTRY III

Code number: NP-38

Cycle: Undergraduate

Semester: 8th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week):
-
Laboratory work (hours/week): 2

Course coordinator: Eleni A. Rekka, professor

Tutor (s):
Eleni A. Rekka, professor
Room 409, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.

Communication: email (rekka@pharm.auth.gr)

Dionysia Papagiannopoulou, lecturer
Room 423a, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310-998680, email (papagd@pharm.auth.gr)

Assisting personnel: One technician

Aims of the course: This course is an introduction to the applications of modern pharmacochemical aspects in drug design and in the successful confrontation of pathologic conditions (incurable, insufficiently cured diseases, toxicity of chemicals), using contemporary pharmacochemical methods. Relations of chemical structure, physicochemical properties and activity are studied. Another aim is the acquisition of satisfactory knowledge of the medicinal chemistry of free radicals, role of oxygen in life, free radical reactions in biological systems, reactive oxygen species and mechanisms of radical attack to lipids, proteins and DNA. Knowledge of physiological defensive mechanisms against free radicals, as well as explanation of oxidative stress are among the aims of this course. Comprehension of the blood-brain barrier, construction, function and physiologic role, in relation to drug action, is another aim.

Furthermore, the course aims at providing basic knowledge on the properties and medical applications of ionizing radiation, as well as the nuclear properties requirements of radionuclides used in radiopharmacy. In a deeper scope, this course covers the pharmaceutical radiochemistry of commonly used radionuclides in radiopharmacy. The design and mechanism of action of common radiopharmaceuticals at the target site is discussed. Finally, the course covers methods of evaluation of the radiochemical purity of radiopharmaceuticals.

Skills: By the end of this course, the students should be able to:

Relate structural features to biologic activity

Comprehend the structure, function and role of blood-brain barrier

Know the phenomenon of oxidative stress, role of free radicals and other active oxygen species in the organism

Comprehend oxidative attack, pharmacochemical confrontation and consequences in health.

The application of radionuclides for diagnosis or treatment based on the type of ionizing radiation emitted, γ, X, β^-, β^+, α.

The basic methods of radiolabeling with radionuclides used in radiopharmaceuticals, ^{99m}Tc, $^{186/188}$Re, $^{123/131}$I, ^{111}In, ^{11}C, ^{18}F.

Quality control methods of technetium radiopharmaceuticals.

Clinical applications of radiopharmaceuticals.

Teaching methods: Lectures and laboratory work. The material is covered by a textbook and laboratory notes.

Contents of the course: This course presents some modern aspects in the broad field of bioactive molecules (drugs, poisons) and the molecular approach to pathologic conditions, aiming to a rational confrontation of them through drug design. The effect of the chemical characteristic groups on activity and toxicity of drug molecules is studied and an approximation in physicochemical properties/chemical structure/activity relationships is performed. Further topics are: Pharmacochemistry of free radicals. Role of oxygen in aerobic life, free radical reactions in biological systems. Reactive oxygen species. Mechanisms of radical attack on lipids, proteins, DNA. Defence of the body against radical offence, the involved mechanisms. Structure, function of blood brain barrier and drug permeability.

Radioactivity: Radioactive decay, α, β^-, β^+, particle emissions, electron capture, γ ray emission, isomeric transition, internal conversion, Auger electrons. Law of radioactivity, Half-life, Successive decay equations, transient and secular equilibrium. Interaction of radiation with matter: ionization, bremsstrahlung, annihilation, photoelectric effect, Compton scattering, pair production. Radiolysis of water, effect of radiation on macromolecules, DNA strand breaks, oxygen effect. *Radionuclide generator:* Principles of a generator. ^{99}Mo/^{99m}Tc generator. Yield of ^{99m}Tc. Radionuclide, radiochemical and chemical purity of ^{99}Mo/^{99m}Tc generator eluate. *Labeled compounds:* Radionuclide, radiochemical and chemical purity of labeled compounds. Methods of radiochemical yield calculation (radiochromatography). *Radiopharmaceuticals*: general principles, diagnostic and therapeutic radiopharmaceuticals. Properties of ^{99m}Tc. Chemistry of ^{99m}Tc. Labeling with ^{99m}Tc (Labeling with reduced ^{99m}Tc, Formation of ^{99m}Tc-complexes by ligands exchange, reducing agents). Techentium(V), oxo core, isomerism. Methods of radioiodination of proteins (iodine chloride, iodogen, chloramin-T, enzymatic methods) *Radiopharmaceuticals of ^{99m}Tc and other radionuclides* (preparation, clinical applications, pharmacokinetic data). Sodium pertechnetate, technetium-sulfur colloid, technetium-human albumin macroaggregates, technetium-DTPA, technetium-glucoheptate, technetium-succimer, trivalent and pentavalent, technetium-methylendiphosphonate, technetium-iminodiacetic acid derivatives, technetium-hexamethylene amine oxime, technetium-ethyl cysteinate dimmer, technetium-mercaptoacetyltriglycine, technetium-hexacis(2-methoxy-isobutyl-isonitrile). [^{188}Re]-rhenium-(hydroxiethylidine diphosphonate). [^{111}In]-Indium-tris (oxine). [$^{123/131}$I]-Sodium Iodide, [$^{123/131}$I]-metaiodobenzyl-guanidine. [^{18}F]-2-fluorodeoxyglucose. Thallium-201. Labeling monoclonal antibodies-advantages and disadvantages. Direct labeling of mAbs with radio-iodine and technetium. Red blood cell labeling with technetium and indium.

Proposed literature:

1. E.A. Rekka, P.N. Kourounakis, "Organic Pharmaceutical Chemistry: Topics in Medicinal Chemistry-Drug Design", F. Hatzipantou, Ed., 2010 (ISBN 978-960-98594-3-1) (in Greek).
2. R. Rodrigo, "Oxidative Stress and Antioxidants: Their Role in Human Disease", 2009, Nova Science Pub Inc.
3. E. Chiotellis, "Radiopharmaceutical Chemistry" Ed. "Pigasos", 2000 (in Greek).
4. Gopal B. Saha, "Fundamentals of Nuclear Pharmacy", Springer, 5th Ed.2003.

Educational activities: Lectures, discussion with the students in every lecture, problem solving and practical work in the laboratory.

Evaluation process and methods: Examination of the course can be done either by successful participation in two written mid-term exams (grade ≥5 in each mid-term exam) of by a final written examination at the end of the semester. Student eligibility to participate in the mid-term exams is gained by regular attendance of the lectures throughout the semester**.** The evaluation process is based on questions that the students are asked to answer based on their knowledge obtained from the lectures as well as on the critical thinking and ability to combine, evaluate and handle the acquired knowledge and information.

The duration of the examination is 3 hours.
The examination at the end of the semester is performed at dates, time and place arranged by the department.
During the laboratory work, students hand over a report of their results and are evaluated. At the end of the laboratory work, there is a written examination on this. Successful termination of the laboratory course permits their participation to the final examination.
At the examination of the course, each instructor gives out separate exam forms.
To compute the final grade, the grade given by each tutor is weighted proportionately to the number of hours he/she has taught.
Final grade is calculated by addition of the course exam grade (90%) and the lab exam grade (10%).
Example: Supposing a course, where 60% of the hours are taught by tutor A and 40% by tutor B, the final grade is calculated by the following formula:

$$F.G.= 0.9(a+b) +0.1c,$$

Where, a the grade given by tutor A (in a scale of 0-6), b the grade given by tutor B (in a scale of 0-4), c the lab grade (the average of the lab book grade and the lab exam grade).

Use of TIC / Electronic distribution of the lectures

Powerpoint presentation is used in the lectures (D. Papagiannopoulou) and the pdf files of the classes are available on Blackboard as well as on the website: user.auth.gr/papagd/Radiofarmaka

Teaching: Teaching of this course is accomplished through lectures and laboratory work.

A) **Lectures**. Lectures are given 2 hours per week in the lecture room D12 (located in the School of Natural Sciences)

Lecture	Title	Tutor
1	Rational drug design. The main role of oxygen in aerobic life. Generation of free radicals in biologic systems.	E. Rekka
2-4	Important reactive oxygen species. Partially reduced oxygen, free radicals.	E. Rekka
5-7	Molecular mechanism of free radical attack. Lipid peroxidation. Protein oxidation. DNA oxidation.	E. Rekka
8-9	Effect of chemical characteristic groups on drug action.	E. Rekka
10-11	Relationships between physicochemical properties and drug action.	E. Rekka
12	Blood brain barrier, physiologic significance, pathologic conditions, drug transport.	E. Rekka
13	Review exercises and problem solving.	E. Rekka
14-15	Properties of Radionuclides	D. Papagiannopoulou
16	Diagnostic and Therapeutic radiopharmaceuticals	D. Papagiannopoulou
17	Radiopharmaceutical preparations and quality control	D. Papagiannopoulou
18	Production and nuclear properties of ^{99m}Tc-^{99}Mo/^{99m}Tc generator	D. Papagiannopoulou
19	Chemistry of technetium-preparation of technetium radiopharmaceuticals	D. Papagiannopoulou
20-22	Technetium Radiopharmaceuticals (renal, cerebral, myocardial, hepatobiliary, lung and bone imaging)	D. Papagiannopoulou
23	Iodine Radiopharmaceuticals	D. Papagiannopoulou
24	Cell Labelling	D. Papagiannopoulou
25	Labelling proteins and monoclonal antibodies	D. Papagiannopoulou
26	Cyclotron Radiopharmaceuticals	D. Papagiannopoulou

B) Laboratory work
Students must do laboratory work (2 hours each).
ATTENTION! The students who want to attend the lab have to fill out a participation form before the beginning of the semester at the Laboratory of Pharmaceutical Chemistry. There is an announcement, calling students to fill out the participation forms at the announcement board of the Laboratory of Pharmaceutical Chemistry.

Laboratory	**Title**	**Tutor**
1-8	Synthesis of sulfanilamide.	E. Rekka
9,10	Identification of an unknown compound by IR spectroscopy and melting point determination.	E. Rekka
11,12	Colourimetirc determination of procaine hydrochloride.	E. Rekka
13	Laboratory test	E. Rekka

DRUG QUALITY CONTROL I

Code number: 69

Cycle: Undergraduate

Semester: 8th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week):
-
Laboratory work (hours/week): 2

Course coordinator: Dimitris G. Fatouros, (assistant professor)

Tutors
Dimitrios G. Fatouros, assistant professor
Contact hours with students: every day.
Communication: e-mail :dfatouro@pharm.auth.gr

Athanasia Panagopoulou, lecturer
Contact hours with students: every day.
Communication: e-mail : pathanas@pharm.auth.gr

Credit Units (ECTS): 4

Aims
To introduce the students to the subject of quality control of pharmaceuticals and the physical, chemical, physicochemical and biological tests and assays used for their assessment.
To establish understanding of laboratory techniques for some of the major branches of pharmaceutical sciences.
To instruct the student on the preparation of laboratory reports, using appropriate statistical and mathematical calculations.

Learning Outcomes
On successful completion of this unit should be, at threshold level,
Demonstrate an understanding of methods employed for the quality controls of pharmaceuticals.
Perform experiments in the laboratory using the most up-to-date techniques for drug stability.
Carry out a given set of laboratory instructions, record and manipulate numerical data and to present this information in an appropriate format.

Syllabus outline
Introduction to quality control of pharmaceuticals. Methods of analysis (physical and physicochemical methods). Pharmaceutical technical procedures. Biological tests and assays. Pharmaceutical stability.

Laboratory practical: Decomposition of phenobarbital and salicylic acid in alkaline environment (orders of reactions, Arrhenius equation, activation energy). Quality control assays of tablets containing ampicillin and prednisolone (dissolution studies, analysis of drug content and weight uniformity).

Learning and Teaching Strategy
The unit will be delivered through a combination of formal lectures and laboratory classes. All laboratory reports will require statistical, computing and mathematical skills. The material is covered by a textbook and a lab note.

Assessment
Four (4) laboratory reports will be submitted within 2 weeks after the final laboratory class and will require analysis and interpretation of experimental data. A successful completion of the unit will be demonstrated by a final written examination at the end of the semester (grade ≥5).

Indicative Reading

1. Physical Pharmacy Fourth Edition, Ed. Al. Martin Lea & Febiger Philaddelphia, London 1993.
2. Pharmaceutics – the Science of Dosage Form Design, 2nd Edition, Churchill Livingstone, London 2002.
3. Drug Stability: Principles and practices Ed. C. T. Rodes and J.O. Cartensen, Marcel Dekker: New York. 1990.

ORGANIC PHARMACEUTICAL CHEMISTRY
Code number: НП-46

Cycle: Undergraduate

Semester: 8th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 4
Lectures (hours/week): 2

Tutorial (hours/week): -
Laboratory work (hours/week): 2

Course coordinator: Vasilis Demopoulos, professor

Tutors:
1) Vassilis Demopoulos, professor
Room 408A & 409B, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 11-12 am.
Communication: e-mail (vdem@pharm.auth.gr)

2) Eleni Rekka, professor
Room 409, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: e-mail (rekka@pharm.auth.gr)

3) Ioannis Nicolaou, lecturer
Room 404, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day 12-1 pm.
Communication: e-mail (inikolao@pharm.auth.gr)

Assisting personnel:
Depending on the laboratory work, a post-graduate student or Dr. Antony Gavalas.

Aims of the course:
The course is an expansion and in depth analysis of the required course (code number: ΝΠ-38) of the same semester and its aim is the application of modern aspects of medicinal chemistry in drug design and in the successful confrontation of pathologic conditions using contemporary approaches of medicinal chemistry & chemical biology. Specifically:
- Scaffolds and physicochemical properties of drug-like molecules. Principles of identification, optimization and production of new chemical entities.
- Oxidative stress, antioxidant pharmacotherapy. Oxidative stress and biologic stress in pathologic conditions. Pharmacochemical aspects of biological stress, relations between biological and oxidative stress. Indices of oxidative and biologic stress and their interrelationships. Consequences of oxidative and of biologic stress on health.

Skills:
By the end of this course, the students will have a working knowledge of:
- The three dimensional graphical depiction of compounds using a molecular modeling software.
- The structural energy minimization implementing molecular & quantum mechanism.
- The two dimensional drawing of compounds and the calculation of distribution & partition coefficients.

- The involvement of oxidative stress in pathologic conditions and diseases and the response of the organism to xenobiotics
- The physiologic defensive mechanisms as stress response

Teaching methods:

Lectures and laboratory work. The material is covered by textbook & notes as well as laboratory notes.

Contents of the course:

1) Vassilis Demopoulos

Chemical biology in medicinal chemistry, with focus on:

a) stereo-chemical factors and biological activity (optical isomerism, spatial isomerism, conformational space)
b) physical & chemical properties important in biological activity (lipophilicity, hydrophobicity, ionization, solubility, molecular polar surface area)
c) bioisosterism
d) thermodynamic analysis of ligand-receptor interactions
e) permeability through biological membranes

2) Eleni Rekka

In this course, pharmacochemical aspects of oxidative and biologic stress, their indices and their relationships are analysed. Importance of oxidative and of biologic stress in diseases of the modern society, e.g. Alzheimer's and Parkinson's diseases, development of biologic stress and other pathologic conditions is examined. Xenobiotic toxicity connected to free radical formation, toxic metabolites, antioxidant intervention are presented.

3) Ioannis Nicolaou

Pharmacochemical approach for the management of the lack of selectivity toward tumor cells and low therapeutic index of the antineoplastic agents, via two primary strategies:

a) through the design of targeted anticancer prodrugs for tumor site-specific activation, and
b) through a tumor-targeting drug delivery system which consists of a tumor recognition moiety (as monoclonal antibodies, polyunsaturated fatty acids, folic acid, hyaluronic acid, and oligopeptides) and a cytotoxic warhead connected directly or through a suitable linker to form a conjugate.

Proposed literature:

1) Vassilis Demopoulos

- Richard B. Silverman "The Organic Chemistry of Drug Design and Drug Action", Academic Press, 2004, ISBN-10: 0126437327
-Joseph J. Cannon "Pharmacology for Chemists", Oxford University Press, 2007, ISBN-10: 0841239274
- Jonathan M. Goodman "Chemical Applications of Molecular Modelling", The Royal Society of Chemistry, 1998, ISBN: 0854045791

- M. P. Edwards and D. A. Price, "Role of Physicochemical Properties and Ligand Lipophilicity Efficiency in Addressing Drug Safety Risks". *Ann. Rep. Med. Chem.,* 45: 381–391 (2010)
- A. Avdeef, "Physicochemical profiling (solubility, permeability and charge state)", *Curr. Top. Med. Chem.,* 1, 277-351 (2001)
- N. A. Meanwell "Synopsis of Some Recent Tactical Application of Bioisosteres in Drug Design", *J. Med. Chem.,* 54, 2529–2591 (2011)
- J. Clayden, S. R. LaPlante et. al. "The Challenge of Atropisomerism in Drug Discovery" *Angew. Chem. Int. Ed.,* 48, 6398 – 6401 (2009)

2) Eleni Rekka

1. E.A. Rekka, P.N. Kourounakis, "Organic Pharmaceutical Chemistry: Topics in Medicinal Chemistry-Drug Design", F. Hatzipantou, Ed., 2010 (ISBN 978-960-98594-3-1) (in Greek).
2. R. Rodrigo, "Oxidative Stress and Antioxidants: Their Role in Human Disease", 2009, Nova Science Pub Inc.

3) Ioannis Nicolaou

- *Journal* of Medicinal *Chemistry* (ACS Publications)

- *Bioorganic & Medicinal Chemistry Letters* - Elsevier

- *Bioorganic & Medicinal Chemistry* (ISSN 0968-0896)

Educational activities:
Lectures, discussion with the students in every lecture, problem solving and practical work in the laboratory.

Evaluation process and methods:
- The evaluation of knowledge and skills which have been acquitted by the students from the course work is attested with written examinations (80% of the final grade + 20% of experimental aptitude) which are conducted in a fixed date. The written examinations have duration of 3.5h, and consist of approximately ten (10) composite questions spherically covering the tough subjects. Grading is proportionally allocated to the tutors.
- The evaluation process is based on questions that the students are asked to answer based on their knowledge obtained from the lectures as well as on the critical thinking and ability to combine, evaluate and handle the acquired knowledge and information.
- During the laboratory work, students hand over a report of their results and are evaluated. Successful termination of the laboratory course permits their participation to the final examination.

Use of TIC / Electronic distribution of the lectures:
Tutors:
1) Vassilis Demopoulos

Lectures:

The haptics (http://www.telegraph.co.uk/education/educationnews/8271656/Write-it-dont-type-it-if-you-want-knowledge-to-stick.html) approach is used

Teaching notes: electronic distribution via USB flash memory.

2) Eleni Rekka
Lectures:

The haptics (http://www.telegraph.co.uk/education/educationnews/8271656/Write-it-dont-type-it-if-you-want-knowledge-to-stick.html) approach is used

3) Ioannis Nicolaou

Lectures, notes, statements etc are presented in the corresponding place of the website of the School of Pharmacy.

Teaching
Teaching of this course is accomplished through lectures, special supportive lectures and laboratory work.
A total of 26 lectures (13 weeks x 2 hours) are given in the lecture room Δ12 implementing power point projection and/or overhead projection, as well as with chalk and a blackboard.

α) Lectures:

Lecture	**Title**	**Tutor**
1	Molecular size/shape, optical & geometric isomerism and biological activity	V. Demopoulos
2	Atropoisomerism-conformers and biological activity	V. Demopoulos
3	Quantitative relationships stereo-structure & activity, polar surface area of molecules	V. Demopoulos
4	Lipophilicity & determination of coefficients of distribution	V. Demopoulos
5	Determination of coefficients of partition	V. Demopoulos
6	Permeation through biological membranes	V. Demopoulos

7	Biopharmaceutical classification of new chemical entities	V. Demopoulos
8	Ligand-receptor interactions and physicochemical properties	V. Demopoulos
9	Classical and non classical isosterism	V. Demopoulos
10	Bioisosterism	V. Demopoulos
11-14	Design of targeted anticancer prodrugs for tumor site-specific activation	I. Nicolaou
15-16	Tumor-targeting drug delivery system which consists of a tumor recognition moiety (as monoclonal antibodies, polyunsaturated fatty acids, folic acid, hyaluronic acid, and oligopeptides) and a cytotoxic warhead connected directly or through a suitable linker to form a conjugate	I. Nicolaou
17-18	OXIDATIVE STRESS AND XENOBIOTIC TOXICITY: Ethanol, carbon tetrachloride, polyhalogenated hydrocarbons, dipyridyl compounds, iron and other heavy metal ions, clofibrate, paracetamol	E. Rekka
19-20	OXIDATIVE STRESS AND PATHOLOGIC CONDITIONS: Hypercholosterolemia, Angiopathies, Hypertension, Cardiovascular diseases, Diabetes mellitus complications	E. Rekka
21-22	OXIDATIVE STRESS AND PATHOLOGIC CONDITIONS: Inflammation, Rheumatoid arthritis, Drugs used in inflammatory conditions, Autoimmune diseases	E. Rekka

23-24	OXIDATIVE STRESS AND PATHOLOGIC CONDITIONS: Neuronal degeneration and oxidative stress, Defense of the brain against oxidative insult, Interaction of iron in the brain, Senile dementia - Alzheimer's disease, Pathobiochemistry of Alzheimer's disease, Cellular death, Cellular damage in Alzheimer's disease, Possible causes of Alzheimer's disease, Aspects of rational drug design in Alzheimer's disease, Parkinson's disease, Causes of Parkinson's disease	E. Rekka
25-26	BIOLOGICAL STRESS AND RESPONSE TO DRUGS: Homeostasis, Biological stress, Manifestations and determination of biologic stress, effect of benzodiazepines, Stress and response to drugs and other xenobiotics, Biologic and oxidative stress interrelationships.	E. Rekka

Laboratory Work:
Students are notified on February of each year to enroll for laboratory work. Students who neglect to enroll in time will perform the laboratory work next proper semester.

The laboratory work will be performed in groups, because the aim of this work, with students in an advanced semester, is the accomplishment of collective, complete experimental work, where the interest is stimulated, the initiative is stressed, the routine work is avoided, and, mainly, the idea of a constructive application of acquired knowledge, as well as of new methods and techniques is materialized.

Laboratory	**Title**	**Tutor**
1-3	3D structural drawing of apomorphine & three chemical derivatives of apomorphine	V. Demopoulos
4-7	Structural energy minimization invoking molecular mechanism & quantum mechanism subrutines	V. Demopoulos

8-9	Listing of results (energies & intramolecular distances)	V. Demopoulos
10-12	2D structural drawing of apomorphine & three chemical derivatives of apomorphine. Calculation of lipophilicity coefficients	V. Demopoulos
13-14	Conformers & Boltzman's distribution. Calculated structural results & reported *in vivo* activity	V. Demopoulos
15-18	Synthesis and identification of paracetamol	E. Rekka
19-22	Induction of hepatotoxicity to rats by the administration of high doses of paracetamol, study of the effect of compounds with different mechanism of action, aiming to the protection of the organism against oxidative insult	E. Rekka
23-26	Determination of the effect of the above treatments, with analysis of indices in blood and liver of the experimental animals.	E. Rekka

PHARMACEUTICAL TECHNOLOGY

Code number: NP 45

Cycle: Undergraduate

Semester: 8th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week):
-
Laboratory work (hours/week): 2

Course Coordinator: Stavros Malamataris (Professor)
Tutors

Stavros Malamataris, Professor
Contact hours with students: every day.
Communication: e-mail : smalam@pharm.auth.

Dimitrios G. Fatouros, assistant professor
Contact hours with students: every day.
Communication: e-mail :dfatouro@pharm.auth.gr

Credit Units (ECTS): 4

Aims
To introduce the students to the subject of drug formulation.
To establish understanding of laboratory techniques for some of the major branches of pharmaceutical sciences.
To instruct the student on the preparation of laboratory reports, using appropriate statistical and mathematical calculations.

Learning Outcomes
On successful completion of this unit should be, at threshold level,
Demonstrate an understanding of methods employed for the drug formulation.
Perform experiments in the laboratory using the most up-to-date techniques for drug quality control.
Carry out a given set of laboratory instructions, record and manipulate numerical data and to present this information in an appropriate format.

Syllabus outline
Pharmacokinetics, trandsermal delivery, micro/nano encapsulation and powder technology.
Laboratory practical: Assessment of powder properties (weight, humidity, temperature) by means of computer aid sensors. Assessment of skin properties (humidity, transepidermal water loss, temperature, pH)

Learning and Teaching Strategy
The unit will be delivered through a combination of formal lectures and laboratory classes. All laboratory reports will require statistical, computing and mathematical skills. The material is covered by a textbook and a lab note.

Assessment
Two (2) laboratory reports will be submitted within 2 weeks after the final laboratory class and will require analysis and interpretation of experimental data. A successful completion of the unit will be demonstrated by a final written examination at the end of the semester (grade ≥5).

Indicative Reading
1. Theoretical and Practical topics in Pharmaceutical Technology. Notes S. Malamataris. Thessaloniki 1985.

DRUG QUALITY CONTROL

Code number: NP 42

Cycle: Undergraduate

Semester: 8th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week):
-
Laboratory work (hours/week): 2

Course Coordinator: Dimitrios G. Fatouros (Assistant Professor)

Tutors
Dimitrios G. Fatouros, assistant professor
Contact hours with students: every day.
Communication: e-mail :dfatouro@pharm.auth.gr

Athanasia Panagopoulou, lecturer
Contact hours with students: every day.
Communication: e-mail : pathanas@pharm.auth.gr

Credit Units (ECTS): 4

Aims
To introduce the students to the subject of bioequivalence as a tool for the quality assessment of pharmaceutical formulations.
To establish understanding of laboratory techniques for some of the major branches of pharmaceutical sciences.
To instruct the student on the preparation of laboratory reports, using appropriate statistical and mathematical calculations.

Learning Outcomes
On successful completion of this unit should be, at threshold level,
Demonstrate an understanding of methods employed for the quality controls of pharmaceuticals.
Perform experiments in the laboratory using the most up-to-date techniques for drug quality control.
Carry out a given set of laboratory instructions, record and manipulate numerical data and to present this information in an appropriate format.

Syllabus outline
The use of Bioequivalence as a tool for the assessment of pharmaceuticals. Development of in *vitro / in vivo* correlations as a tool for the quality control of pharmaceuticals. Statistics for bioequivalence studies.
Laboratory practical: Quality control assays of tablets containing acetaminophen (dissolution studies, analysis of drug content and weight uniformity).

Learning and Teaching Strategy
The unit will be delivered through a combination of formal lectures and laboratory classes. All laboratory reports will require statistical, computing and mathematical skills. The material is covered by a textbook and a lab note.

Assessment
Two (2) laboratory reports will be submitted within 2 weeks after the final laboratory class and will require analysis and interpretation of experimental data. A successful completion of the unit will be demonstrated by a final written examination at the end of the semester (grade ≥5).

Indicative Reading

1. Physical Pharmacy Fourth Edition, Ed. Al. Martin Lea & Febiger Philaddelphia, London 1993.
2. Pharmaceutics – the Science of Dosage Form Design, 2nd Edition, Churchill Livingstone, London 2002.
3. Drug Stability: Principles and practices Ed. C. T. Rodes and J.O. Cartensen, Marcel Dekker: New York. 1990.

COSMETICS

Code number: 32

Cycle: UNDERGRADUATE STUDIES

Semester: 8th

Course type

	Background/General knowledge
X	Scientific area (Pharmacy)

Credit Units (ECTS): 4

Lectures (hours/week): 2

Tutorial (hours/week):

Laboratory work (hours/week): 2

Course coordinator:
KATSIOTIS STAVROS (Associate Professor)

Tutor (s): KATSIOTIS STAVROS (Associate Professor)
e-mail: stakat@pharm.auth.gr

Assisting personnel: ATHANASIOU ANASTASIOS

Aims of the course: The main target of the is the acquisition of the necessary knowledge for the recognition and comprehension of the prescriptions following by the preparation of the appropriate technological formulation of cosmetics.

Skills: Acquisition of the necessary knowledge and possibilities for the recognition either of the raw material that are used in the different types of the cosmetic preparations and of the technological formulations, as far as the evolvement of the student skills in the management of the different preparation methods of the cosmetic formulations. Nevertheless the students will be familiarized with the handling of the different laboratory apparatus and implements in cosmetics.

Teaching methods: Lectures and Laboratory exercises.

Teaching methods:

Lectures and Laboratory exercises.

Περιεχόμενο του μαθήματος:

Basic on the anatomy and the physiology of the skin. Cosmetics such as emulsions, refreshing creams O/W and W/O. Lotions, face masks, cosmetic powders, lipsticks, nails cosmetics, shampoo and hair preparations, deodorants and antiperspirants, suntan preparations, face and eye makeup, bath preparations, perfumes and colognes, shaving preparations. Procedures for the Headspace Extraction coupled on Gas Liquid Chromatography.

Laboratory Exercises: Preparations of cosmetics

Educational activities:

Attendance of the lectures and the Laboratory exercises.

Evaluation process and methods:

Attendance of the Laboratory exercises regularly, writing and presentations of specified reports; evaluation.
Written exams at the end of the semester

Use of ICTs (Information and Communication Technologies) / Electronic distribution of the lectures

Certain lectures are carried on with the use of electronic applications

Teaching:

A) **Lectures**. Two hours per week in the Δ12 classroom of the School of Science

Lecture	Title	Tutor
1	Introduction, Basic on the anatomy and the physiology of the skin	Katsiotis S.
2	Preparation of cosmetics, emulsions, refreshing creams O/W and W/O	Katsiotis S.
3	Preparation of cosmetics, Lotions	Katsiotis S.
4	Preparation of cosmetics, face masks	Katsiotis S.
5	Preparation of cosmetics, cosmetic powders	Katsiotis S.
6	Preparation of cosmetics, Make-up, lipsticks	Katsiotis S.
7	Preparation of cosmetics, nails cosmetics	Katsiotis S.
8	Shampoo and hair preparations	Katsiotis S.
9	Preparation of cosmetics, bath preparations	Katsiotis S.
10	Preparation of cosmetics, shaving preparations	Katsiotis S.
11	Preparation of cosmetics, deodorants and antiperspirants, suntan preparations	Katsiotis S.
12	Perfumes and colognes	Katsiotis S.
13	Procedures for the Headspace Extraction coupled on Gas Liquid Chromatography	Katsiotis S.

B) **Laboratory work** The Laboratory exercises are carried out by Katsiotis and Athanasiou.

Laboratory	Title	Tutor
1	Preparation of Cosmetics	Katsiotis S.
2	Preparation of Cosmetics	Katsiotis S.

3	Preparation of Cosmetics	Katsiotis S.

NON PRESCRIPTION DRUGS

Code number: NP 39
Cycle :
Undergraduate (selective)
Semester : 8

Course Type

	Background / General Knowledge
+	Scientific area: Pharmacy

Credit units (ECTS): 4

Lectures (hours per week): 2
Tutorial (hours): -

Laboratory (hours per week): 2

Course coordinator:
Panagopoulou Athanasia, lecturer in Pharmaceutical Technology.
Tutor
Panagopoulou Athanasia (lecturer)
E-mail:pathanas@pharm.auth.gr

Assistant personel:
-

Aims of the course:
Tutoring about the drugs and pharmaceutical forms that are supplied from the pharmacy stores without the need of a doctors rp. The pharmacist role in self care and all they need to know about patient education.

Skills :
By the end of the course , the student should be able to work in a pharmacy store and attend to the needs of the patients that come for help before attending to a doctor , seeking for self therapy.

Teaching methods:
Lectures .

Contents of the course:
Over the Counter or Non Prescription Drugs. Pharmaceutical dosage forms. Introduction, basic principals of Self Care and Nonprescription Pharmacotherapy. Criteria of choice. Non Prescription Drugs in Greece and in the European Community. Characterization of drugs as OTC. The pharmacists role in self care and Non Prescription Pharmacotherapy. Patient assessment and consultation. OTC drugs for dermatologic disorders. Anatomy and physiology of the skin. External use pharmaceutical forms for the treatment of atopic dermatitis, acne. fungal skin infections , contact dermatitis, psoriasis, dry skin therapy. Pain and fever disorders. Non prescription analgesics, drugs for the treatment of fever, anti- inflammatory drugs. Non Prescription Drugs for the treatment of minor burns and sunburns. OTC for diabetes mellitus.OTC for ophthalmic disorders. Gastrointestinal disorders (antacids, laxatives, antidiarrheal agents, antiemetic drugs). Alternative medicine.

Educational activities:
Lectures, discussion with the students in every lecture .

Evaluation process:
Written examination by the end of the semester. The duration of the examinations is 2 hours.

Use ofΤΠΕ / electronic distribution of the lectures:
Power point presentation is used in the lectures.

Teaching (lectures, laboratories)
Teaching of this course is accomplished through lectures.
α) Lectures . The lectures (2 hours per week) are taking place once a week in the lecture room of the 2nd floor , in the building of Biology and Pharmacy. (Department of Pharmaceutical Technology).
The titles of the lectures are in preparation.

SEMESTER IX

Practical Training

Code number: PA1

Cycle: Undergraduate

Semester: 9th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 30

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): Five days per week 9-2

Course coordinator:
Dimitra Hadjipavlou-L;itina, professor

Tutor (s):
D. Hadjipavlou-Litina, professor
Room 408B, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310997627, e-mail (hadjipav@pharm.auth.gr)

Eugene –K. Kokkalou, professor
Room 316, 3rd floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310997634, e-mail (kokkalou@pharm.auth.gr)

Ioannis Niopas, professor
Room 306, 3rd floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: e-mail (niopas@pharm.auth.gr)
Stavros Katsiotis associate professor
Room 209, 2nd floor Biology/Pharmacy building.
Collaboration with students: Every day.

Communication: e-mail (stakat@pharm.auth.gr)

Assisting personnel:

Aims of the course: The course helps the students of the Pharmacy School to understand and get experienced in a community Pharmacy/a Hospital pharmacy/a pharmaceutical Industry, for the safe and efficient use of drugs by the patients and society, in general.

Skills: By the end of this course, the students should be able to: a) to exert their profession in a community pharmacy or in a hospital pharmacy or in a pharmaceutical industry, b) to communicate with the patient.

Teaching methods: Lectures, lectures by invited eminent scientists (covering all the areas of the pharmaceutical science), case studies.

Contents of the course:

Pharmaceutical praxis in the community pharmacy, facing specific cases in prescriptions, first aids, ethics, safety

Functionality, organization of the hospital pharmacy

Good manufacture in pharmacy, validation process

Proposed literature:

1. National Formulary
2. European Pharmacopoea
3. Hellenic-Greek Pharmacopoea

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Educational activities: Lectures, discussion with the students in every lecture, problem solving and practice in the pharmacy.

Evaluation process and methods: Examination of the course can be done by a final oral examination at the end of the semester**.** The evaluation process is based on questions that the students are asked to answer based on their knowledge obtained from the lectures and training in the pharmacy as well as on the critical thinking and ability to combine, evaluate and handle the acquired knowledge and information.

The examination at the end of the semester is performed orally at dates, time and place arranged by the department.

Use of ΤΠΕ / Electronic distribution of the lectures

Teaching: Teaching of this course is accomplished through lectures.

A) **Lectures**. Lectures are given 2 hours per week in the lecture room-auditorium D12 Building of the School of Natural Sciences

Lecture	**Title**	**Tutors**
1-5	Pharmacy in praxis (community pharmacy)	Hadjipavlou-Kokkalou-Niopas-Katsiotis
6-9	Organization, functionality, action in hospital pharmacy	Hadjipavlou-Kokkalou-Niopas-Katsiotis
10-11	Good manufacture in Pharmacy	Hadjipavlou-Kokkalou-Niopas-Katsiotis
12-13	Validation process	Hadjipavlou-Kokkalou-Niopas-Katsiotis

SEMESTER X

Practical Training
Code number: PA2

Cycle: Undergraduate

Semester: 10th

Course type

	Background/General knowledge
X	Scientific area (pharmacy)

Credit Units (ECTS): 30

Lectures (hours/week): 2

Tutorial (hours/week): -

Laboratory work (hours/week): Five days per week 9-2

Course coordinator:
Dimitra Hadjipavlou-L;itina, professor

Tutor (s):
D. Hadjipavlou-Litina, professor
Room 408B, 4th floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310997627, e-mail (hadjipav@pharm.auth.gr)

Eugene –K. Kokkalou, professor
Room 316, 3rd floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: 2310997634, e-mail (kokkalou@pharm.auth.gr)

Ioannis Niopas, professor
Room 306, 3rd floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: e-mail (niopas@pharm.auth.gr)
Stavros Katsiotis associate professor
Room 209, 2nd floor Biology/Pharmacy building.
Collaboration with students: Every day.
Communication: e-mail (stakat@pharm.auth.gr)

Assisting personnel:

Aims of the course: The course helps the students of the Pharmacy School to understand and get experienced in a community Pharmacy/a Hospital pharmacy/a pharmaceutical Industry, for the safe and efficient use of drugs by the patients and society, in general.

Skills: By the end of this course, the students should be able to: a) to exert their profession in a community pharmacy or in a hospital pharmacy or in a pharmaceutical industry, b) to communicate with the patient.

Teaching methods: Lectures, lectures by invited eminent scientists (covering all the areas of the pharmaceutical science), case studies.

Contents of the course:

Pharmaceutical praxis in the community pharmacy, facing specific cases in prescriptions, first aids, ethics, safety

Functionality, organization of the hospital pharmacy

Good manufacture in pharmacy, validation process

Proposed literature:

4. National Formulary
5. European Pharmacopoea
6. Hellenic-Greek Pharmacopoea

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Educational activities: Lectures, discussion with the students in every lecture, problem solving and practice in the pharmacy.

Evaluation process and methods: Examination of the course can be done by a final oral examination at the end of the semester**.** The evaluation process is based on questions that the students are asked to answer based on their knowledge obtained from the lectures and training in the pharmacy as well as on the critical thinking and ability to combine, evaluate and handle the acquired knowledge and information.

The examination at the end of the semester is performed orally at dates, time and place arranged by the department.

Use of ΤΠΕ / Electronic distribution of the lectures

Teaching: Teaching of this course is accomplished through lectures.

B) **Lectures**. Lectures are given 2 hours per week in the lecture room-auditorium D12 Building of the School of Natural Sciences

Lecture	Title	Tutors
1-5	Pharmacy in praxis (community pharmacy)	Hadjipavlou-Kokkalou-Niopas-Katsiotis
6-9	Organization, functionality, action in hospital pharmacy	Hadjipavlou-Kokkalou-Niopas-Katsiotis
10-11	Good manufacture in Pharmacy	Hadjipavlou-Kokkalou-Niopas-Katsiotis
12-13	Validation process	Hadjipavlou-Kokkalou-Niopas-Katsiotis

DISSERTATION REGULATIONS
SCHOOL OF PHARMACY – ARISTOTLE UNIVERSITY OF THESSALONIKI
(General Assembly 433/13-03-12)

DISSERTATION : 8 credits

Introduction – Aim

The new Curriculum (2008-) provisions optional pursue of a Dissertation. This Dissertation may be an experimental paper, rather than a paper based on literature, focusing on a specific topic, of a total duration of one (1) semester, with the possibility to extend to two more semesters. The results are submitted for assessment to the supervising professor.

A Dissertation may be pursued upon completion of the 7^{th} semester and students may opt for a Dissertation instead of two electives offered in the 8^{th} semester of studies. Each student is assigned a Dissertation at the beginning of the spring semester. The aim of the Dissertation is to help the student both to systemise and apply the knowledge acquired during his studies and to work in depth on a specific subject area.

Selection – Assignment of topic – Pursue of a Dissertation

For the purposes of selecting students to pursue a Dissertation, the Teaching Faculty of the School of Pharmacy will take into consideration students' academic performance.

Each member of the Teaching Faculty will announce available posts and subject areas, in which students may express their interest to pursue a Dissertation. There is no limit to the number of Dissertations supervised by an individual member of the Teaching Faculty (with the exception of limitations due to availability of laboratory facilities, instruments, materials and financial resources etc.). Each topic may be undertaken by one student.

Following successful selection of students by the Teaching Faculty of the appropriate laboratory/direction, a letter of the student’s acceptance by the Teaching Faculty must be submitted to the Registry using a standard form and indicating the Dissertation topic. A list of student names and the respective supervisors is sent to all Departments by the Registry.

The students pursuing a Dissertation are in regular contact and close cooperation with their supervisor, who monitors progress of their work and approves its printing and examination. It should be noted that if a Dissertation is not completed within three (3) semesters as provisioned, the supervisor is released of this commitment and in such a case, the student is

required to select two (2) electives of those offered in the eighth (8^{th}) semester.

It is required that the Dissertation is submitted in (2) hard copies, one of which should be submitted to the supervisor and the other to the Registry of the School. In addition, a digital copy should be submitted to the Registry of the School.

Assessment – Grading – Presentation

Dissertations will be examined by the respective Teaching Faculty member who supervises the Dissertation and will be assessed on the following criteria: a) the extent to which the student has met the requirements of the topic, b) quality of content and presentation, c) literature review on the topic, d) consistency of work and good laboratory practice during pursue of the Dissertation.

The grade is submitted to the Registry of the School in the same procedure as the one followed for all subjects of the Curriculum (printed grading form or electronic submission). Dissertations are examined only during the regular examination sessions of each academic year.

Dissertations are presented and examined in public, during set dates in every examination session, before the supervising member of the Teaching Faculty, other members of the Teaching Faculty, students and anyone else who may be interested. The supervising member of the Teaching Faculty is responsible for organising presentations.

General Provisions

Any issue that may arise from implementing these Regulations, which is not provisioned by these, is settled by the Board of Administration of the School. Lastly, any amendments or additions to these Regulations are determined by the General Assembly of the School.

HELLENIC REPUBLIC
ARISTOTELIO PANEPISTIMIO THESSALONIKIS (ARISTOTLE UNIVERSITY OF THESSALONIKI)
SCHOOL OF PHARMACY
http://www.pharm.auth.gr, Tel. +30 +30 2310997613, Fax +30 +30 2310997612, e-mail: info@pharm.auth.gr, A.U.Th., 54124, THESSALONIKI, Greece.

DIPLOMA SUPPLEMENT

This Diploma Supplement is based on the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original accompanying qualification to which this supplement is appended. It should be free from any value judgments, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1. INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1 Family Name(s):

1.2 Given Name(s) :

1.3 Date of birth (day/month/year), Place, Country of Birth:

1.4 Student identification number or code:

2. INFORMATION IDENTIFYING THE QUALIFICATION

2.1 Name of the qualification and (if applicable) title conferred (in original language):

Ptychio Farmakeftikis (Degree in Pharmacy)

2.2 Main field(s) of study for the qualification:

with specialization field:

2.3 Name and status of awarding institution (in original language):

Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης (Α.Π.Θ.), Δημόσιο Πανεπιστήμιο, Τμήμα Φαρμακευτικής (Aristoteleio Panepistimio Thessalonikis-Aristotle University of Thessaloniki, A.U.Th.), Public University, School of Pharmacy.

2.4 Name and status of institution (if different from 2.3) administering studies (in original language) :

As in 2.3.

2.5 Language(s) of instruction/examination: Greek

3. INFORMATION ON THE LEVEL OF THE QUALIFICATION

3.1 Level of qualification: Integrated 1st and 2nd Cycle

3.2 Official length of programme:

10 SEMESTERS, 300 ECTS.
A full academic year is equivalent to 60 ECTS units and each semester to 30 ECTS (European Credits Transfer System) (1 ECTS= 25-30 hours) (according to the Greek Law 1466/13-8-2007, No 5/89656/B3, art. 1,2,3). To each course is given a number of ECTS (>=2) according to the student's work load (contact hours, laboratory work, examination etc) for the full completion of the course.

3.3 Access requirement(s):

Upper secondary degree (six years of studies)- national level examination.

4. INFORMATION ON THE CONTENT AND RESULTS GAINED

4.1 Mode of study:

Full - time

4.2 Programme requirements - aims:

The students complete their studies and obtain the degree in Pharmacy when having succeeded in the anticipated courses (compulsory and elective) and accumulated 300 ECTS. The courses are allocated to eight semesters and the practical training is pursued for 2 semesters (30 ECTS per semester, 4x3 quarters) (9th to 10th) and includes: a)a pharmacy opened to the public (min: 6 months) b)a hospital pharmacy (min: 3 months) c)a pharmaceutical industry (elective)).
The students at the 8th semester must choose one of the two Directions (Direction I-Direction II) and be examined in all the courses of the selected direction. The examination is written/oral or in an assignment form.
The undergraduate study program (USP) provided by the School of Pharmacy aims at training pharmacists to understand the chemical structure and the pharmacological activity of the drugs, their bioavailability, biodegradation, metabolism, the used methods for drugs synthesis as well as the used methods for their evaluation (synthesis and drug formulation).

At the applied level, USP also aims in training and providing the graduates with the nescessary skills related to the sector of drug and health. Specifically, upon successful competition of their studies graduates of the School of Pharmacy based on their courses, diploma and practical training can acquire training and skills closely related to:

a) The chemical and pharmacochemical study of substances of pharmaceutical and of broader biological interest, the chemical and pharmacochemical study of chemical compounds (organic, inorganic, metallo-organic) of broader pharmaceutical-biological interest, Design, synthesis (isolation), separation, properties, control (identification, purity, content) , the chemical and pharmacochemical study (biological response, biodegradation, bioavailability, metabolism, interaction) of the biologically active agents, the structure-activity relationship between molecular structure/action of biologically active agents, the quantitative structure-properties-activities relationships of all the above, the study of chemical principles and methods that support the development of pharmacochemistry and the chemical aspect of immunology.

b) the pharmaceutical practices and legislation (prescription execution and pharmacotechnical tasks at the Pharmacy and the Hospital), the consideration of pharmaceutical agents and preparations and of their application and action systems (physical and physiochemical laws) from a physiopharmaceutical point of view, the basic pharmacotechnical elaborations at semi-industrial and industrial scale of the raw material and pharmaceutical agents, as well as their design, technology and formatting into preparations and cosmetics, the assessment of the quality of medicines, cosmetics and generally of natural products, of preparations and substances by applying control methods (physiochemical, technological, microbiological, in vivo, etc.), the pharmaceutical technology of the preparations and the factors affecting their efficiency during their in vivo implementationand the technological study of factors affecting the obtaining, treatment and control of natural products and of their components.

c) the chemistry of natural products (of vegetative, animal, mineral origin), that is, isolation of active components, identification, control and chemical study,the pharmaceutical study of medicines and aromatic plants (essential oils, alkaloids, etc.: analysis, standards and improvement methods), description of medicines, classification, microscopic control, isolation, identification, control and biogenesis of their natural products , the Biotechnology of Pharmaceutical Plants and the implementation of physiochemical methods used in Pharmacognosy.

d) the pharmacological development of new medicines, the improvement of known pharmaceutical agents and the study of the structure and pharmacological action at biochemical, molecular level (in vitro), as well as in situ (isolated organs) and in vivo (laboratory animals), the pharmacodynamic study of the pharmacological actions, undesirable effects, and interactions between medicines, the analysis of the action of chemotherapeutic agents for microbial infections, parasitic diseases, viruses and neoplasms, the pharmacological analysis and clinical testing of medicines (absorption, distribution, elimination mechanisms of medicines), dosage determination, therapeutic protocols, medicine interactions, the pharmacogenetic study of the idiosyncrasy, metabolism, addiction, psychic and natural dependence and resistance to medicines, the immunopharmacological analysis of allergenic factors, pharmaceutical agents, mechanisms of immunosuppression by medicines and the pharmacological basis of hyperaesthesia phenomena, the toxicological study of medicine undesirable effects mechanisms, of natural products, poisons, teratogens and mutagens in vitro or in vivo, the study of the pharmacological action of micro-molecular factors (vaccines, sera, proteins, hormones, etc.) and of microorganisms' metabolism products, which are prepared with biotechnology methods and the development of therapeutic reagents for neurodegenerative diseases.

Graduates of the School of Pharmacy, further to the basic knowledge of their discipline and profession are able to: 1) apply knowledge in practice, 2) communicate in a foreign language, 3) search, process, analyse and synthesize data and information, use also the necessary technologies, 4) adapt to novel situations and make decisions, 5) work independently or in groups in international and/or interdisciplinary contexts, 6) generate new research ideas and designe and manage projects, 7) respect diversity, multiculturalism and the natural environment, 8) demonstrate social, professional and moral responsibility and sensitivity to gender issues, 9) view themselves as well as others critically, 10) promote free, inductive and deductive thinking.

4.3 Programme details (e.g. modules or units studied and individual grades/marks/credits obtained):

The student has successfully completed practical training of 4 quarters (**60 ECTS**).
Courses that the student has successfully attended, as well as subjects for which the student has received recognition or exemption (COR = Core courses, COM = Compulsory courses belonging to the selected specialization, ELC = Elective courses, ELM=Elective courses belonging to the selected specialization, FL= Foreign Language (Foreign Language is taught from 1 to 6 semesters and contributes as one grade in the Degree), EX = Exchange, DIS = Dissertation):

Code	Courses	Type	ECTS credits	Grade	Examination period	ECTS Grading

			(Student workload)			
1	GENERAL MATHEMATICS	COR	7.0	9.0	JUN 2007	B
2	GENERAL PHYSICS	COR	7.0	9.0	JUN 2007	B
3	GENERAL CHEMISTRY	COR	7.0	8.0	JUN 2007	A
4	QUALITATIVE ANALYTICAL CHEMISTRY	COR	6.5	9.0	JUN 2007	B
10	MICROBIOLOGY	COR	4.0	5.0	JUN 2007	D
11	QUANTITATIVE ANALYTICAL CHEMISTRY	COR	6.5	7.0	JUN 2007	B
7	BOTANY	COR	4.0	8.0	JUN 2007	B
8	GEN. ORGANIC CHEMISTRY	COR	9.0	6.0	JUN 2007	B
9	CELL BIOLOGY	COR	6.0	7.0	JUN 2007	B
20	INORGANIC PHARMACEUTICAL CHEMISTRY	COR	6.0	7.0	FEB 2008	B
21	BIOCHEMISTRY I	COR	4.0	8.0	FEB 2008	B
22	SPECIFIC ORGANIC CHEMISTRY	COR	7.0	8.0	FEB 2008	B
23	PHARMACEUTICAL ANALYSIS I	COR	6.5	7.0	FEB 2008	B
24	PHYSICAL CHEMISTRY	COR	4.0	10.0	FEB 2008	A
31	BIOCHEMISTRY II	COR	4.0	9.0	JUN 2008	A
33	PHARMACEUTICAL ANALYSIS II	COR	7.0	7.0	JUN 2008	B
34	PHARMACEUTICAL CHEMISTRY (ORGANOMETALLICS AND HORMONES)	COR	6.5	8.0	JUN 2008	A
35	PHYSIOLOGY	COR	4.0	10.0	JUN 2008	A
46	GENERAL PHARMACEUTICAL TECHNOLOGY	COR	6.0	10.0	JUN 2008	A
32	DISPENSING	COR	6.0	10.0	FEB 2009	A
47	GENERAL PHARMACOGNOSY	COR	6.5	8.0	FEB 2009	B
48	ORGANIC PHARMACEUTICAL CHEMISTRY I	COR	6.5	8.0	FEB 2009	A
49	PHARMACOLOGY I	COR	6.5	7.0	FEB 2009	B
50	PHYSICAL PHARMACY	COR	4.0	7.0	FEB 2009	B
51	BIOPHARMACEUTICS	COR	5.5	9.0	JUN 2009	A
52	SPECIFIC PHARMACEUTICAL TECHNOLOGY I	COR	6.0	9.0	JUN 2009	A
53	APPLIED PHARMACOGNOSY I	COR	6.0	9.0	JUN 2009	A
54	ORGANIC PHARMACEUTICAL CHEMISTRY II	COR	6.0	10.0	JUN 2009	A
55	PHARMACOLOGY II	COR	6.0	6.0	JUN 2009	C
66	SPECIFIC PHARMACEUTICAL TECHNOLOGY II	COR	6.0	9.0	FEB 2010	A
67	EMERGENCY MEDICAL TREATMENT	COR	2.0	10.0	FEB 2010	B
68	APPLIED PHARMACOGNOSY II	COR	6.0	9.0	FEB 2010	A
69	DRUG QUALITY CONTROL I	COR	4.0	7.0	FEB 2010	B
70	ORGANIC PHARMACEUTICAL CHEMISTRY III	COR	7.0	9.0	FEB 2010	A
71	TOXICOLOGY	COR	5.0	9.0	FEB 2010	A
5	INTRODUCTION TO PHARMACEUTICAL SCIENCES & LEGISLATION	ELC	2.0	5.0	JUN 2007	D
84	MOLECULAR BIOLOGY	ELC	2.0	9.0	FEB 2008	B
41	HYGIENE	ELC	2.0	6.0	JUN 2008	D
12	ENGLISH LANGUAGE I	FL	0.5	8.0	JUN 2007	C
16	ENGLISH LANGUAGE II	FL	0.5	8.0	JUN 2007	C
25	ENGLISH LANGUAGE III	FL	0.5	5.0	FEB 2008	D
36	ENGLISH LANGUAGE IV	FL	0.5	8.0	JUN 2008	B
56	ENGLISH LANGUAGE V	FL	0.5	7.0	FEB 2009	C
61	ENGLISH LANGUAGE VI	FL	0.5	6.0	JUN 2009	C
78	APPLIED PHARMACOLOGY AND THERAPEUTICS	COM	6.0	9.0	JUN 2010	A
79	CLINICAL PHARMACOKINETICS	COM	6.0	9.0	JUN 2010	A
80	CLINICAL CHEMISTRY	COM	4.0	10.0	JUN 2010	A
81	RADIOPHARMACEUTICAL CHEMISTRY	COM	5.0	9.0	JUN 2010	A
82	DISPENSING (OVER THE COUNTER MEDICATIONS)	COM	5.0	9.0	JUN 2010	A
83	HEALTHY FOOD AND DIET PRODUCTS	COM	4.0	10.0	JUN 2010	A
TOTAL ECTS			**240.0**			

The Degree is awarded according to the required minimum local credit units (167.0) and the student may be examined in two more optional courses(Ministerial Decision no Φ.1231/B1/425, art. 60 section 3, Hellenic Government Gazette no 1099/2000/B)

ECTS grading (A=10%, B=25%, C=30%, D=25%, E=10%) is based on a sample of a minimum of 100 students. If the sample is

not sufficient then nothing is noted (according to the Ministerial Decision no Φ.5/89656/Β3, art. 4, Hellenic Government Gazette no 1466/2007/B). The ECTS grading system is based on the Annex 3 of the ECTS Guide, 2009, and on Crocker, L., & Algina, J. (1986). Introduction to classical and modern test theory. New York: Harcourt Brace Jovanovich College Publishers.

Dissertations or/and Internship projects as well are considered as individual projects and they are not graded based on a previous sample. The same stands for the Erasmus courses for which we accept the grading of the receiving institution and we convert it to the local grade accordingly.

4.4 Grading scheme, and if available, grade distribution guidance :

A. A scale of 1 to 10 applies to the marks of each subject in the Hellenic higher education. The grading scheme is as follows in the qualification Ptychion (according to the regulation 1099/5-9-2000/B, art. 60):
Άριστα (Arista) Excellent : 8.50-10.00
Λίαν Καλώς (Lian Kalos) Very Good : 6.50-8.49
Καλώς (Kalos) Good : 5.00-6.49
Minimum passing grade : 5

4.5 Overall classification of the qualification (in original language):

"Λίαν Καλώς" (Very Good): 8.24

5. INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1 Access to further study:

The qualification is a terminal award and allows access to postgraduate studies.

5.2 Professional status (if applicable):

Professional licence is required to establish and manage pharmacy retail bussiness, to serve as a pharmacist in a state hospital or to serve in a state health service.

6. ADDITIONAL INFORMATION

6.1 Additional information:

6.2 Further information sources

School of Pharmacy: http://www.pharm.auth.gr
Aristotle University of Thessaloniki: http://www.auth.gr
Ministry of Education and Religious Affairs, Culture and Sports: http://www.minedu.gov.gr
European Union Educational Issues: http://www.europa.eu
Eurydice: http://eacea.ec.europa.eu/education/eurydice

7. CERTIFICATION OF THE SUPPLEMENT

7.1 Date:

7.2 Name and Signature:

7.3 Capacity: President of the School

7.4 Official Stamp or seal:

This certificate is issued for foreign authorities and is signed by the President of the School according to the regulation No. 49923/2008 (Hellenic Government Gazette no 873/2008/B).

8. INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM

Pursuant to the Constitution (article 16, paragraph 5), Greek Tertiary Education is public and gratis. Furthermore, according to the legal framework, it is divided into:

(a) the University sector (A.E.I.): Universities, Technical Universities, Fine Arts School, etc., and
(b) the Technological sector (T.E.I.): Technological Education Institutions and the School of Pedagogic and Technological Education.

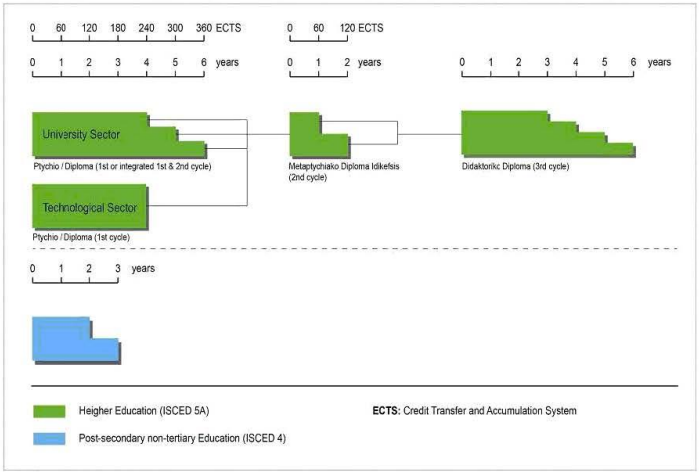
Part of the University sector is also, since 1998, the Greek Open University, which provides open and distance -undergraduate and postgraduate- education and training.
There are also state post-secondary non-tertiary Institutions offering vocationally oriented courses of shorter duration (2 to 3 years), which operate under the authority of other Ministries.

All graduates of secondary education (Geniko and Epagelmatiko Lykeio) can be admitted to Higher Education Institutions, depending on the general score obtained in national examinations that take place at the end of the final year of Lyceum. The admission system is based on the number of available places (numerus clausus), the candidates' performance, and the candidates' ranked preferences of Schools. Admission to particular schools may also require a special examination (eg drawing for Architecture, etc.).

Study programmes in Higher Education Institutions last from four to six years, depending on the subject area. Students who successfully complete their studies are awarded a Ptychio / Diploma, which permits employment or further studies at post-graduate level leading to a Metaptychiako Diploma Eidikefsis (2nd cycle) - equivalent to the Master's degree- and to the doctorate degree (3d cycle), Didaktoriko Diploma.
Legislation on quality assurance in Higher Education, the Credit Transfer and Accumulation System (ECTS) and the Diploma Supplement defines the framework and the criteria for the evaluation of Higher Education Institutions, and for the certification of programmes of studies. These measures aim, among others, at promoting student mobility and contributing to the creation of the European Higher Education Area.

A detailed description of the Greek Education System is offered in:

- EURYDICE (<http://www.eurydice.org>) database of the European Education Systems.
- <http://eacea.ec.europa.eu/education/eurydice/documents/thematic_reports/122EN.pdf> (pages 82,83)



GRADUATE STUDIES

GRADUATE STUDIES PROGRAM

MASTER'S DEGREE IN THE PHARMACEUTICAL SCIENCES

Duration of the Program: Four semesters

Areas of Specialization:

A. Medicinal Chemistry, Development of Pharmaceutical Compounds

B. Pharmaceutical Technology

C. Biotechnology – Molecular Diagnostics

D. Pharmacology and Therapeutics

E. Pharmacognosy – Plant Pharmaceutical Products

DOCTORATE IN PHARMACY

Duration of the Program: Eight to sixteen semesters

Who can apply

Eligible applicants include holders of an undergraduate degree from the Schools of Pharmacy, Chemistry, Biology, Medicine, Dentistry, Veterinary Science, Agriculture, Forestry and Chemical Engineering.

Prerequisites

Non-pharmacists accepted in the program may need to attend certain courses from the Undergraduate Program of the School of Pharmacy. The possible number and kind of courses will be decided by the Graduate Program Committee and the General Assembly of the School. The Assembly will take into account the scientific background of the candidates and the Area of Specialization they will be enrolled. The candidates have to pass the exams for these courses within the first two semesters.

Candidates must have grades higher than 7 in a scale from 1 to 10 (at least B) in the three undergraduate courses most affiliated to their chosen Area of Specialization. Otherwise, they must take exams and improve their grades within the first two semesters.

Area of Specialization A. MEDICINAL CHEMISTRY, DEVELOPMENT OF PHARMACEUTICAL COMPOUNDS

The aim of the direction is the transfer of knowledge for the further and deeper scientific background in the field of Medicinal Chemistry[1] (Definitaion of Medicinal Chemistry according to the IUPAC:Medicinal Chemistry is a chemistry-based discipline, also involving aspects of biological, medical and pharmaceutical sciences. It is concerned with the invention, discovery, design, identification and preparation of biologically active compounds, the study of their metabolism, the interpretation of their mode of action at the molecular level and the construction of structure-activity relationships) of drug development and the pharmacochemical study of bioactive compounds, such as additive agents, food-cosmetic additives, environmental pollutant.Graduates of this direction acquire contemporary knowledge and experience in order to actively contribute in drug and health matters in society, Pharmaceutical industry, hospitals, state health offiicies, national and European drug authorities, educational and research institutions.

Relevant undergraduate courses: Pharmaceutical Chemistry (Hormones-Organometallics)

Organic Pharmaceutical Chemistry II

Organic Pharmaceutical Chemistry III

1. CHEMISTRY OF COMPOUNDS OF PHARMACEUTICAL INTEREST (Falla semester)

Instructors: V. Demopoulos, A. Geronikaki, D. Hadjipavlou, D. Papagiannopoulou (Fall semester)

a) Synthetic methods of pharmaceutically interesting compounds (classical and retrosynthetic methods) .

b) Study of the chemical properties related to the structure (analysis of the functional groups) of drug molecules, their identification, determination and investigation of their action.

c) Exaples of radiopharmaceutical compounds of major pharmaceutical interest.

2. Structure Elucidation of Pharmaceutical Compounds – Applications of Computer Technology in Pharmacochemistry

Instructors: A. Geronikaki, V. Demopoulos, I. Nikolaou (Fall semester)

Includes:

a) Application of spectroscopic, chromatographic and other method for structure elucidation or isolation of pharmaceutically interesting compounds.

3. Advanced Topics in the Metabolism of Xenobiotics

Instructors: E. Rekka, P. Kourounakis (Spring semester)

a) Fate of the drugs in the organism (absorption, distribution, metabolism, excretion) – Sites of loss

b) Chemical mechanisms followed in the biotransformation of xenobiotics. Purpose, phase, enzyme inducers and inhibitors, biiodetoxication-biotoxication.

c) Specific categories of drugs (pro-drugs, soft drugs, hard drugs, chemical delivery systems).

4. Methods of Drug Synthesis with Emphasis to Heterocyclic Medicinal Chemistry

Instructors: A. Geronikaki, I. Nikolaou (Spring semester)

a) Industrial production of starting or intermediate compounds in drug synthesis.

b) Synthetic methods used in synthesis of the most important groups of bioactive compounds.

c) Medicinal Chemistry of heterocyclic compounds with one or more heteroatoms

5. Specific Topics of advanced Medicinal Chemistry

Instructors: E. Rekka D. Papagiannopoulou (Spring semester)

a) Chemical bonds and drug action. G-protein-coupled receptors.

b) Radiodignostic drugs. Radiotherapeutic pharmaceutical compounds (Diagnosis of neurological disorders, Diagnosis-Therapy of cancer)
c) Inflammation and Anti-Inflammatory Drugs _ Introduction to Immunochemistry
d) .Pharmaceutical aspects of addition to drugs and other compounds. Drug and Ethics.

6. Advanced Medicinal Chemistry: Drug Design, Selected Drug Synthesis

Instructors: E. Rekka, D. Hadjipavlou, P. Kourounakis (Spring semester)

a) Introduction to the use of computer in topics concerning applications in medicinal Chemistry.
b) Relationships between structure and physicochemical properties and biological activity (SAR). Quantitative structure-activity relationships (QSAR).
c) Medicinal Chemistry of free radicals (chemistry action and significance, consequences and protection)
d) Pharmacochemical approaches in thetreatment of contemporary diseases. Methods for the application of biotransformations in Pharmacy. Environment friendly Pharmaceutical Industry. Chemistry manipulation of drugs.

Area of Specialization B. PHARMACEUTICAL TECHNOLOGY

Related undergraduate courses: Special Pharmaceutical Technology I

Drug Quality Control

Pharmaceutical Analysis I

1. Design, Development and Production of Dosage Forms

Instructors: S. Malamataris (Fall semester)

a) Preformulation tests and selection of excipients and dosage form.
b) Characterization of raw materials for the production of dosage forms.
c) Principles, mechanisms, and variables affecting the quality of the end products during pharmaceutical unit operations.

d) Specific formulation aspects of solid dosage forms (powders, capsules, tablets, pellets, inhalations).
e) Design, development and production of liquid dosage forms.
f) Production of sterile dosage forms.
g) Industrial Pharmaceutical Microbiology.
h) Controlled (programmed release) dosage forms. Recent research and development trends in pharmaceutical formulation.
i) Production of biotechnological pharmaceutical materials (peptides and proteins). Preformulation stages, selection of the dosage forms and the excipients involved. Stability assessment and prediction of the biotechnological products.

2. Computer Applications in Pharmaceutical Technology

Instructors: I. Nikolakakis, K. Kachrimanis (Fall semester)

Acquisition, processing and analysis of data through computers.

A. Data acquisition: Transducers, interfacing with signal acquisition and processing systems.
B. Processing and analysis of data:
a) Experimental designs and data analysis software. Types and choice of factorial design. Multiple linear regression and evaluation of model fitting to data (statistical interferology). Analysis of variance for more than one dependent variables (MANOVA) and methods of grouping variables. Response surface designs and methods for process optimization. Application in Pharmaceutical Technology using statistical and graphical software programs: SPSS, EXCEL, SIGMAPLOT.
b) Analysis of data using Artificial Neural Networks. Theoretical considerations. Types of neural networks. Computer programs available for neural networks simulation.
c) Exploratory data analysis. Methods for analysis based on graphical representation of data (Data Visualization). Static representation of data – modern techniques. Interactive dynamic graphics.

3. Advanced Pharmaceutical Analysis

Instructors: I. Koundourellis, C. Markopoulou (Spring semester)

a) Statistics for Pharmaceutical Analysis.
Analytical Problems. (Types of error, random and systematic errors in classical analysis. Mean and standard deviation. Confidence limits

of the mean). Significance tests (Comparison of an experimental mean with a known value. Paired t-test. F-test for the comparison of standard deviation. Analysis of variance). Errors in instrumental analysis – regression and correlation. (Calibration curves in instrumental analysis. Errors in the slope and intercept of the regression line. Calculation of a concentration. Limits of detection. The method of standard addition).

b) Derivative Spectrophotometry.
Development of the derivative method. Theoretical considerations (Peak-peak method. Peak-tangent method. Peak zero method. Peak-peak ratio method. Differentiation-integration method. Partial least squares method. Filtering smoothing and averaging).

c) Chromatography
Chomatographic theory. Bonded phase chromatography. Liquid-Liquid chromatography. High Performance Liquid chromatography. (Essential features. Column packing, characteristics. The partitioning phases. Other separation variables. Applications). Liquid-solid chromatography. Ion-exchange chromatography. Ion pair chromatography. Size-exclusion chromatography.Gradient Elution and related procedures.

d) Mass Spectrometry.
Basic principles. Instrumentation of mass spectroscopy. Isotope abundance. The molecular analysis of mixtures. Mass spectroscopy problems.

e) Flame emission and atomic absorption spectroscopy.
Introduction. Emission and absorption in flames. Atomization and Ionization. Flames. Burners and nebulizers. Nonflame atomization. Radiation sources and optical systems. Quantitative analysis. Typical applications.

f) FT- Raman Spectroscopy
Basic principles.

4. Advanced Topics in Physical Pharmacy

Instructors: I. Nikolakakis, K. Kachrimanis (Spring semester)

a) The design of experiments for the study of pharmaceutical phenomena.

b) Estimation of experimental results through mathematical methods.
c) Methods of measurement of drug physicochemical properties (pH, refraction index, viscosity, surface tension, zeta potential, particle size, etc.).
d) Preparation of new dispersion systems for pharmaceutical use.
e) Incorporation of pharmaceutical substances into dispersion systems.
f) Study of the release of pharmaceutical substances from dispersion systems.
g) Study of the permeation of membranes by pharmaceutical substances.

5. Drug Quality Control – Sustained Delivery Systems

Instructors: D. Fatouros, A. Panagopoulou (Fall semester)

a) Advanced topics in Drug Quality Control
b) GMP.
c) Introduction to sustained drug delivery systems.
d) Effect of the route of administration and the properties of the drugs on sustained drug delivery systems.
e) Polymers and their use in sustained drug delivery systems.
f) Routes of administration (*per os*, transdermal, ocular, parenteral, implanted)
g) Liposomes – nanospheres
h) New chemical aspects for sustained delivery

6. Technology and Quality Control of Natural Products – Preparation of Cosmetics from Natural Products

Instructor: S. Katsiotis (Spring semester)

a) Naturally occurring raw materials.

b) Physical procedures and technology of processes applied on various plant materials.

c) Processing units for plant materials.

d) Processes of obtaining secondary products of high added value.

e) Quality control – analysis – of raw materials and final products.

f) Application of special analytical methods.

g) Formulation and uses of secondary products.

h) Cosmetic preparations from natural products.

Area of Specialization C. BIOTECHNOLOGY–MOLECULAR DIAGNOSTICS

Related undergraduate courses: Pharmacology I

Pharmacology II

Introduction to Biotechnology

1. Molecular Pharmacology and Pharmacogenetics

Instructors: A. Tsiftsoglou, I. Vizirianakis (Fall semester)

a) Molecular mechanisms of drug-receptor binding
b) Molecular mechanisms of drug resistance.
c) Biotechnology of protein drugs.
d) The application of pharmacogenetic-pharmacogenomic principles in personalized medicine and clinical practice.
e) Pharmacology of the Central Nervous System (CNS) and Psychopharmacology.
f) Chemotherapy of viral, bacterial and parasitic infections.
g) Pharmacology of the hematopoietic and immune system.
h) Pharmacology of neoplastic diseases.

2. Molecular Biology

Instructors: C. Panagiotidis, T. Sklaviadis, M. Arsenakis (Fall semester)

a) Gene and chromosome structure (from the bacterial operons to the structure of the eucaryotic spliced genes. Functional remodeling of the DNA structure, chromatin structure and function).
b) DNA replication (General aspects, enzymology, replicons, viral replication), DNA repair and DNA recombination.
c) Cell cycle control, checkpoints and carcinogenesis.
d) Transcription initiation regulation in procaryotic and eucaryotic cells (RNA polymerases, transcription factors, regulatory sequences). Transcription termination and mRNA maturation. Transcription and maturation of tRNAs and rRNAs.

e) Translational control of gene expresssion (Regulation of translation initiation, elongation and release, and factors involved).
f) Posttranslational protein modifications, protein folding and chaperon proteins.
g) Resctriction enzymes, principles of gene cloning. Cloning and expression vectors. Construction of gene libraries, library screening for the presence or expression of genes and clone analysis.
h) Protein expression, gene walking, mutagenesis, gene knockouts.
i) Epigenetics (gene dosage effects, gene imprinting, genetic reprogramming and evolution).

3. Biotechnology of Pharmaceutical Plants

Instructors: A. Kanellis, P. Chatzopoulos, K. Vlachonasios (Spring semester)

a) Cell and tissue culture.
b) Plant genetic modification (GM technology).
c) Genetic modification of pharmaceutical and aromatic plants.
d) Screening of plant GM.
e) Analysis of gene expression.
f) Gene silencing.
g) Production of pharmaceutical substances and aromatic compounds via genetic engineering.
h) Bioethics.

4. Pharmaceutical Biotechnology I (Molecular Techniques for the Analysis of Macromolecules)

Instructors: C. Panagiotidis, T. Sklaviadis, S. Kouidou-Andreou, T. Laliaris (Spring semester)

a) Basic principles of nucleic acid analysis - Enzymes, electrophoresis, DNA and RNA blots, nucleic acid sequencing.
b) DNA cloning, cloning vectors, subcloning, DNA libraries, Basic principles of PCR (polymerase chain reaction).
c) Genome organization and mapping techniques, consequences of genome sequencing projects.
d) Functional characterization of genes and genetic analysis (use of cloned genes, RNA and protein structure analysis, expression levels).
e) Use of recombinant DNA techniques for molecular diagnosis.
f) Nucleic acid isolation from tissues or biological fluids, nucleic acid hybridization techniques, and PCR application for the diagnosis of

infectious diseases, hereditary defects, Genetically Modified Organisms etc.).

g) Electrophoretic analysis of proteins and western blotting. Applications of immunoelectrophoretic methods in molecular diagnosis.
h) Applications of immunodiagnostic techniques for the identification of infectious agents, levels of biomolecules in biological fluids etc.

5. Pharmaceutical Biotechnology II / Technologies for the Production of Pharmaceuticaland Diagnostic Substances through Genetic Engineering

Instructors: A. Tsiftsoglou, L. Papadopoulou, A. Kanellis (Fall semester)

a) Molecular mechanisms of gene expression in eukaryotic cells.
b) Cloning expression systems and PCR technology.
c) Development of recombinant proteins from GMOs and quality control.
d) cDNA microarrays and genotyping analysis.
e) Somatic cell cloning biotechnologies and therapeutic cloning (Embryonic Stem Cells).
f) Intracellular delivery of peptides-proteins.
g) RNA interference.
h) Hybridoma technology and genetically modified vaccines.
i) Bioreactors and microbial production of secondary metabolites.
j) Enzyme engineering and chemical/catalytic processes.
k) Biochemical/metabolic engineering.
l) Biotechnology of natural food products.
m) Molecular medicine and agriculture: Pharmaceuticals and dietary products.
n) Edible vaccines.

6. Bioinformatics / Computer Applications in Molecular Biology and Biotechnology

Instructors: L. Papadopoulou, C. Ouzounis (Spring semester)

a) Computer Science applications in Molecular Biology and Biotechnology.
b) Introduction to Bioinformatics.

c) Use of electronic resourses (Internet, NCBI, EXPASY) for Molecular Biology and Genomics/Proteomics.
d) Comparative study of DNA, RNA and protein sequences through databases.
e) Gene mapping – Polymorphic SNPs and mutations.
f) Analysis of gene regulatory elements.
g) Prediction of protein-protein interactions and protein function.
h) From genomics to drugs through computing.

Area of Specialization D. PHARMACOLOGY AND THERAPEUTICS

Related undergraduate courses: Pharmacology I

Pharmacology II

Introduction to Biotechnology

1. Pharmacodynamics and Chemotherapy

Instructors: A. Tsiftsoglou, I. Vizirianakis (Fall semester)

a) Drug delivery to tissues.
b) Drug-receptor binding and signal transduction pathways.
c) Drug development and new technologies.
d) Pharmacokinetics – Pharmacogenomics.
e) Mechanisms of drug resistance and drug delivery in clinical practice.
f) Pharmaceutical Biotechnology (Vaccines, Antibodies, Peptides and Secondary metabolites).
g) Pharmacology of the Autonomous Nervous System (ANS) and the Cardiovascular System.
h) Mechanisms of hormonal action and endocrinopharmacology.
i) Pharmacology of the Central Nervous System (CNS) and Psychopharmacology.
j) Chemotherapy of viral, bacterial and parasitic infections.
k) Pharmacology of the hematopoietic and immune system.
l) Pharmacology of neoplastic diseases.

2. Drug-Drug Interactions

Instructors: I. Vizirianakis (Spring semester)

a) Drug-drug interactions in clinical practice.
b) Pharmacodynamic and pharmacokinetic drug-drug interactions.

c) Adverse drug reactions (ADRs) and drug-drug interactions.
d) Drug-nutrient interactions and pharmaceutical care.
e) Mechanisms involved in drug-drug and drug-nutrient interactions (P-glycoprotein; P-gp; enteric metabolism; hepatic metabolism).
f) Genetic polymorphism of genes involved in drug action and pharmaceutical care (e.g. CYP isoforms, G-protein coupled receptors, lipoxygenase, apolipoprotein E4, UGTs, NATs).
g) Personalized drug therapy and pharmacogenomics.
h) New drug discovery and development technologies in current drug delivery.
i) Pharmaceutical biotechnology, biotechnology-based drugs and drug-drug ineractions.
j) Drug prescribing, medical errors and drug-drug interactions.
k) Evidence-based learning and web-based learning for improving the education of health care providers in drug-drug interactions.
l) Pregnancy and drug-drug interactions.
m) Drug-drug ineractions in the elderly.

3. Physiology - Pathophysiology

Instructor: L. Boutis (Fall semester)

a) Physiology of various sytems (nervous, gastrointestinal, hemopoietic, urinary, cardiovascular)
b) Pathophysiology of various cardiovascular system diseases (high blood pressure, cardiac failure, myocardial infraction, etc.) and
c) Pathophysiology of various neoplasias (breast, prostate, liver, lungs, skin, gastrointestinal and pangreatic melanomas, acute leukaemia, pediatric tumors).

4. Pharmaceutical Biotechnology I (Molecular Techniques for the Analysis of Macromolecules)

Instructors: C. Panagiotidis, T. Sklaviadis, S. Kouidou-Andreou, T. Laliaris (Spring semester)

a) Basic principles of nucleic acid analysis - Enzymes, electrophoresis, DNA and RNA blots, nucleic acid sequencing.
b) DNA cloning, cloning vectors, subcloning, DNA libraries, Basic principles of PCR (polymerase chain reaction).
c) Genome organization and mapping techniques, consequences of genome sequencing projects.

d) Functional characterization of genes and genetic analysis (use of cloned genes, RNA and protein structure analysis, expression levels).
e) Use of recombinant DNA techniques for molecular diagnosis.
f) Nucleic acid isolation from tissues or biological fluids, nucleic acid hybridization techniques, and PCR application for the diagnosis of infectious diseases, hereditary defects, Genetically Modified Organisms etc.).
g) Electrophoretic analysis of proteins and western blotting. Applications of immunoelectrophoretic methods in molecular diagnosis.
h) Applications of immunodiagnostic techniques for the identification of infectious agents, levels of biomolecules in biological fluids etc.

5. Pharmaceutical Analysis

Instructors: I. Koundourellis, C. Markopoulou (Spring semester)

a) Statistics for Pharmaceutical Analysis.
Analytical Problems. (Types of error, random and systematic errors in classical analysis. Mean and standard deviation. Confidence limits of the mean). Significance tests (Comparison of an experimental mean with a known value. Paired t-test. F-test for the comparison of standard deviation. Analysis of variance). Errors in instrumental analysis – regression and correlation. (Calibration curves in instrumental analysis. Errors in the slope and intercept of the regression line. Calculation of a concentration. Limits of detection. The method of standard addition).

b) Derivative Spectrophotometry.
Development of the derivative method. Theoretical considerations (Peak-peak method. Peak-tangent method. Peak zero method. Peak-peak ratio method. Differentiation-integration method. Partial least squares method. Filtering smoothing and averaging).

c) Chromatography
Chomatographic theory. Bonded phase chromatography. Liquid-Liquid chromatography. High Performance Liquid chromatography. (Essential features. Column packing, characteristics. The partitioning phases. Other separation variables. Applications). Liquid-solid chromatography. Ion-exchange chromatography. Ion pair chromatography. Size-exclusion chromatography.Gradient Elution and related procedures.

d) Mass Spectrometry.

Basic principles. Instrumentation of mass spectroscopy. Isotope abundance. The molecular analysis of mixtures. Mass spectroscopy problems.

e) Flame emission and atomic absorption spectroscopy.
Introduction. Emission and absorption in flames. Atomization and Ionization. Flames. Burners and nebulizers. Nonflame atomization. Radiation sources and optical systems. Quantitative analysis. Typical applications.

f) FT- Raman Spectroscopy.
Basic principles.

6. Pharmacokinetics

Instructor: I. Niopas (Fall semester)

a) Metabolite pharmacokinetics.
b) Pharmacokinetics during disease states.
c) Nonlinear pharmacokinetics.
d) Multiple compartments.
e) Intermittent IV infusions.
f) Physiological approach to clearance.
g) Kinetics of the pharmacological effect.
h) Therapeutic drug monitoring.
i) Variability of pharmacokinetic parameters.
j) Dosage regimens.
k) Pharmacokinetic simulations.
l) Pharmacokinetic/Pharmacodynamic simulations.
m) Dose-dependent and time-dependent pharmacokinetics. Bioequivalence studies.

Area of Specialization E. PHARMACOGNOSY – PLANT PHARMACEUTICAL PRODUCTS

Related undergraduate courses: Pharmacognosy I

Pharmacognosy II

Chemistry of Natural Products

1. Terpenoids and derivatives. Spectroscopic Methods for Structure Elucidation of Terpenoids

Instructor: E. Kokkalou, D. Lazari (Fall semester)

a) Introduction: Biogenetic generalities.
b) Monoterpenes of a regular chemical structure, iridoids, sesquiterpenes, essential oils, definition, localization, distribution, physicochemical properties, function, chemical structures, factors affecting polarity, chemical profile, pharmacological action and toxicity.
c) Pyrethrines, sesquiterpene lactones – Allergies and toxicities.
d) Diterpenes, chemical structure (toxic and bioactive compounds).
e) Triterpenes and steroids, biological and pharmacological properties, raw materials for the hemi-synthetic production of steroids. "Adaptogenic" triterpenic compounds. Cardiac glycosides, other steroids and triterpenes (cucurbitacines, quasinoids, limonoids).
f) Tetraterpenes, distribution, function and uses.
g) Modern techniques of extraction and characterization. Quantitative determination for every group of chemically homogenous compounds. Spectrometric techniques for their structure elucidation (UV-Vis, IR, 1H NMR, 13C NMR, MS-CI, LC-MS, FAB, GC/MS).
h) Analytical techniques at a qualitative and a quantitative level.
i) Applicable analytical techniques for the isolation of the compounds of the above groups (TLC, CC, GC, HPLC).

2. Pharmacological Methods of Phytotherapy Evaluation

Instructor: I. Niopas (Spring semester)

a) Presentation of results.
b) Preparation of plant material.
c) Pharmacological methods and evaluation of phytomedicines.
d) Phytotherapeutic systems. Principles of phytotherapy.
e) Pharmaceutical preparations of phytomedicines.
f) Dosage and dosage forms of phytomedicines.
g) Phytotherapeutic approach to pathological states and system dysfunction.
h) Central nervous system. Cardiovascular system. Respiratory system. Digestive system. Liver and bile. Urinary system. Joint diseases. Skin diseases. Agents that increase resistance to diseases.

3. Phenolic Compounds and Derivatives. Spectroscopic Methods for Structure Elucidation of Phenolic Compounds

Instructor: D. Lazari (Spring semester)

The current main interests of this section are plant-derived secondary metabolites (from medicinal plants), especially phenolic compounds: phenols, phenolic acids, phenylpropanoids, flavonoids, tannins, quinines, anthocyanins.

The study of these includes:

a) Introduction, structure and occurrence, biosynthesis, medical and industrial applications.
b) Isolation and separation: extraction methods, preliminary purification, physical and chemical properties, chromatographic methods (PC, TLC, CC, GC, HPLC).
a) The elucidation of the structure of phenolic compounds through spectroscopic methods (UV, IR, 1H-NMR, 13C-NMR, MS).
b) Other analytical/chemical techniques: hydrolysis methods, sugar analysis, co-chromatography, chemical procedures.

4. Modern Techniques of Bioactivity Control

Instructor: D. Hadjipavlou (Spring semester)

This course implements computers, internet-based international databases, and various computational packages in the teaching and laboratory practice of graduate students. Students become familiar with Computational Chemistry (theory and "tools") and with the Quantitative relations between structure and activity. Bibliographic data regarding the biological responses of active substances of certain medicinal plants are examined and used for the extraction of general equations and practical conclusions that will help the theoretical approach to the activity of other, structurally similar compounds, whose activity has not been experimentally determined.

5. Alkaloids and Derivatives. Spectroscopic Methods Used for Structure Elucidation of Alkaloids

Instructor: E. Kokkalou (Fall semester)

a) Definition, physicochemical properties, distribution, detection and characterization, general methods of isolation, quantification of the alkaloids of the extracts.
b) Pseudoalkaloids and protoalkaloids.

c) Tropane alkaloids (tropanoles, alkaloids, formation of the tropane ring, official plants, qualitative control and toxicity control). Pyrrolizidine alkaloids (chemical structures, structure-toxicity, plant-derived industrial raw materials).Quinolizidine alkaloids (chemical structures, structure, activity, toxicity). Indolizidine alkaloids (chemical structures, structure-toxicity, pharmacodynamics). Piperidine alkaloids (chemical structures). Alkaloids, derivatives of the nicotinic acid (structure, raw materials for the collection, dynamic activity-structure). Alkaloids, derivatives of phenylalanine and thyrosine (structure and activities).
d) Phenylathylamines (structures, activities). Isokinoleic alkaloids. Introduction – Oxidative coupling. Benzylisokinoleines. Dibenzyltetrahydroisokinoleines, courares and other structures of natural origin, aporfinoids, protoberberines and derivatives, morfinanes. Dynamic properties. Phenylethylisokinoleines, structures, pharmacological properties. Calvolines and hallucinogenic indolic derivatives. Properties. Ergolines, chemical structures, qualitative controls, dynamic activity, hemi synthetic and hydrogenated derivatives, structure – activity correlation.
e) Indolomonoperpenic alkaloids: Major chemical structures (coryanthreanes, strynchnanes, natural and hemi synthetic derivatives) and their pharmacological properties. Natural raw materials, Quinoleines, Akridones, Quinazolines, imidazoles, terpenic alkaloids of several structures. Chemical structure – action – toxicity, natural raw materials. Purinic bases. Natural raw materials, structures and pharmacological properties.
a) Applicable extraction methods (industry and laboratory) for all the above given alkaloid groups.
b) The applicable analytical or preparative techniques and testing of general qualitative control of the raw materials.
c) The physicochemical characteristics and spectroscopic methods used for structural elucidation at least for the pattern molecules of each group.

6. Designing Semisynthetic Modifications

Instructor: V. Demopoulos (Fall semester)

In this course the graduate students will become familiar with the concept of synthon (i.e. structural unit which is part of a molecule and is related to possible synthetic processes) as a major "working tool" in the preparation of organic molecules of pharmacological interest. The

examples which will be used in the course are of pharmaceutical interest derived from international published data.

HELLENIC REPUBLIC
ARISTOTELIO PANEPISTIMIO THESSALONIKIS (ARISTOTLE UNIVERSITY OF THESSALONIKI)
SCHOOL OF PHARMACY
http://www.pharm.auth.gr, Tel. +30 +30 2310997613, Fax +30 +30 2310997612, e-mail: info@pharm.auth.gr, A.U.Th., 54124, THESSALONIKI, Greece.

DIPLOMA SUPPLEMENT

This Diploma Supplement is based on the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original accompanying qualification to which this supplement is appended. It should be free from any value judgments, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1. INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1 Family Name(s):

1.2 Given Name(s) :

1.3 Date of birth (day/month/year), Place, Country of Birth:

1.4 Student identification number or code:

2. INFORMATION IDENTIFYING THE QUALIFICATION

2.1 Name of the qualification and (if applicable) title conferred (in original language):

Μεταπτυχιακό Δίπλωμα Ειδίκευσης, Μ.Δ.Ε. (Metaptychiako Diploma Eidikefsis-Postgraduate Degree of Specialisation).

2.2 Main field(s) of study for the qualification:

PHARMACOLOGY AND THERAPEUTICS.

2.3 Name and status of awarding institution (in original language):

Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης (Α.Π.Θ.), Δημόσιο Πανεπιστήμιο, Τμήμα Φαρμακευτικής (Aristoteleio Panepistimio Thessalonikis-Aristotle University of Thessaloniki, A.U.Th.), Public University, School of Pharmacy.

2.4 Name and status of institution (if different from 2.3) administering studies (in original language) :

As in 2.3.

2.5 Language(s) of instruction/examination: Greek

3. INFORMATION ON THE LEVEL OF THE QUALIFICATION

3.1 Level of qualification: 2nd Cycle

3.2 Official length of programme:

4 SEMESTERS, 120 ECTS.
A full academic year is equivalent to 60 ECTS units and each semester to 30 ECTS (European Credits Transfer System) (1 ECTS= 25-30 hours) (according to the Greek Law 1466/13-8-2007, No 5/89656/B3, art. 1,2,3). To each course is given a number of ECTS (>=2) according to the student's work load (contact hours, laboratory work, examination etc) for the full completion of the course.

3.3 Access requirement(s):

PTYCHIO (Degree from a University in Greece or from a recognized foreign institution of equivalent status (Schools of Pharmacy, Chemistry, Biology, Medicine, Dentistry, Veterinary, Agricultural, Chemical Engineering and similar) or from a Technological Education Institute).
Language Certificate (English preferred).

4. INFORMATION ON THE CONTENT AND RESULTS GAINED

4.1 Mode of study:

Full - time

4.2 Programme requirements - aims:

To obtain their qualification from the postgraduate studies programme (PSP) "Post Graduate Studies Program in Pharmaceutical sciences" of the Schools of Pharmacy, Chemistry, Biology,Medicine, Dentistry, Veterinary, Agricultural, Chemical Engineering and similar, students have to complete successfully the 4 semesters that correspond to 120 ECTS (according to the Greek Law 1466/13-8-2007, No 5/89656/B3, art. 1,2,3). They have to attend and complete successfully the exams of the 1st-3rd semesters courses (basic knowledge, scientific area, skill development) that correspond to 90 ECTS. During the 4th semester, they have to submit a Master Thesis which they defend in public (30 ECTS).
The programme aims at providing high quality postgraduate studies and qualifies pharmacists for the development of pharmaceutical compounds, for Pharmaceutical Technology, drugs synthesis and drug s formulation, their bioavailability, biodegradation, metabolism, Biotechnology, Molecular Diagnostics, Pharmacocnosy, Plant pharmaceutical products.
The programme is organised to promote an interdisciplinary approach and produce skilled scientific personnel for research, public service and private sector protection as well as the social and economic development framework of Greece. The programme involves theoretical, laboratory and internship in a systemic approach and concern of drug, social health and sustainable development in terms of humanity.
The postgraduates of the IPSP are capable of handling Data bases (MS Access), bibliographic bases (e.g. Refworks), logistic platforms like Blackboard, remote sensing, simulation models, analyses, univariate, and multivariate analyses.
Upon completion in addition to the basic knowledge of their discipline and profession graduates are also able to: 1) apply knowledge in practice, 2) communicate in a second foreign language 3) search, process, analyse and synthesize data and information, use also the necessary technologies, 4) adapt to novel situations and make decisions, 5) work independently or in groups in international and/or interdisciplinary contexts, 6) generate new research ideas and design and manage projects, 7) respect diversity, multiculturalism and the natural environment, 8) demonstrate social, professional and moral responsibility and sensitivity to gender issues, 9) reflect on themselves and on others critically, 10) promote free, inductive and deductive thinking.

4.3 Programme details (e.g. modules or units studied and individual grades/marks/credits obtained):

Courses that the student has successfully attended, as well as subjects for which the student has received recognition or exemption (COR = Core courses, COM = Compulsory courses belonging to the selected specialization, ELC = Elective courses, ELM=Elective courses belonging to the selected specialization, FL= Foreign Language (Foreign Language is taught from 1 to 6 semesters and contributes as one grade in the Degree), EX = Exchange, DIS = Dissertation):

Code	Courses	Type	ECTS credits (Student workload)	Grade	Examination period	Percentile rank
ΦΘ0001	PHARMACODYNAMICS AND CHEMOTHERAPY	COR	15.0	7.0	FEB 2009	33.33
ΦΘ0003	PHYSIOLOGY-PATHOPHYSIOLOGY	COR	15.0	9.0	FEB 2009	66.67
ΦΘ0002	DRUG-DRUG INTERACTIONS	COR	15.0	9.0	JUN 2009	100.00
ΦΘ0004	PHARMACEUTICAL BIOTECHNOLOGY I-MOLECULAR TECHNIQUES FOR THE ANALYSIS OF MACROMOLECULES	COR	15.0	9.0	JUN 2009	100.00
ΦΘ0005	PHARMACEUTICAL ANALYSIS	COR	15.0	9.0	JUN 2009	100.00
ΦΘ0006	PHARMACOKINETICS	COR	15.0	7.0	FEB 2010	33.33
PROJECT						
	Master Thesis:		30.0	9		
TOTAL ECTS			**120.0**			

Master Thesis: « »

ECTS grading (A=10%, B=25%, C=30%, D=25%, E=10%) is based on a sample of a minimum of 100 students (according to the Ministerial Decision no Φ.5/89656/B3, art. 4, Hellenic Government Gazette no 1466/2007/B). If the sample is not sufficient then it appears the percentile rank of a score in its frequency distribution (the percentage of scores that are the same or lower than it in a specific exam period). Percentile ranks are not on an equal-interval scale.

Dissertations or/and Internship projects as well are considered as individual projects and they are not graded based on a previous sample.

4.4 Grading scheme, and if available, grade distribution guidance :

A. A scale of 1 to 10 applies to the marks of each subject in the Hellenic higher education. The grading scheme is as follows in the qualification Ptychion (according to the regulation 1099/5-9-2000/B, art. 60):
ΑΡΙΣΤΑ (Arista) Excellent : 8.50-10.00
ΛΙΑΝ ΚΑΛΩΣ (Lian Kalos) Very Good : 6.50-8.49
ΚΑΛΩΣ (Kalos) Good : 5.00-6.49
Minimum passing grade : 6

4.5 Overall classification of the qualification (in original language):

"Αριστα" (Excellent): 8.52

5. INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1 Access to further study:

The qualification is a terminal award and allows access to doctoral studies.

5.2 Professional status (if applicable):

No professional qualification is necessary to be employed in the Public or Private sector for the graduates of the Postgraduate Study Program.

6. ADDITIONAL INFORMATION

6.1 Additional information:

6.2 Further information sources

School of Pharmacy: http://www.pharm.auth.gr
Aristotle University of Thessaloniki: http://www.pharm.auth.gr
Ministry of Education and Religious Affairs, Culture and Sports: http://www.minedu.gov.gr
European Union Educational Issues: http://www.europa.eu
Eurydice: http://eacea.ec.europa.eu/education/eurydice

7. CERTIFICATION OF THE SUPPLEMENT

7.1 Date:

7.2 Name and Signature:

7.3 Capacity: President of the School

7.4 Official Stamp or seal:

This certificate is issued for foreign authorities and is signed by the President of the School according to the regulation No. 49923/2008 (Hellenic Government Gazette no 873/2008/B).

8. INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM

Pursuant to the Constitution (article 16, paragraph 5), Greek Tertiary Education is public and gratis. Furthermore, according to the legal framework, it is divided into:

(a) the University sector (A.E.I.): Universities, Technical Universities, Fine Arts School, etc., and
(b) the Technological sector (T.E.I.): Technological Education Institutions and the School of Pedagogic and Technological Education.

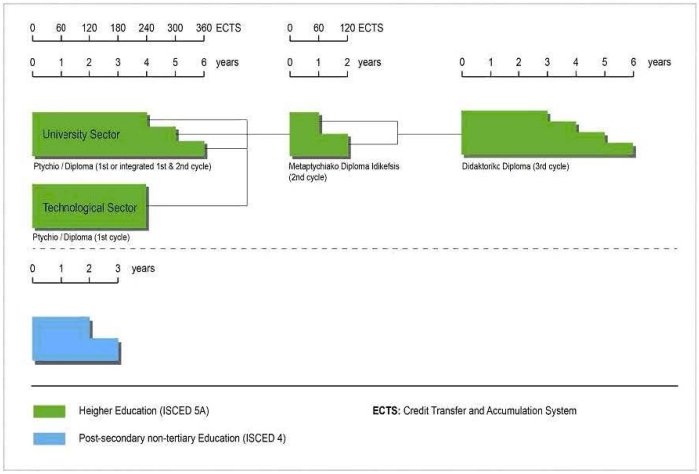
Part of the University sector is also, since 1998, the Greek Open University, which provides open and distance -undergraduate and postgraduate- education and training.
There are also state post-secondary non-tertiary Institutions offering vocationally oriented courses of shorter duration (2 to 3 years), which operate under the authority of other Ministries.

All graduates of secondary education (Geniko and Epagelmatiko Lykeio) can be admitted to Higher Education Institutions, depending on the general score obtained in national examinations that take place at the end of the final year of Lyceum. The admission system is based on the number of available places (numerus clausus), the candidates' performance, and the candidates' ranked preferences of Schools. Admission to particular schools may also require a special examination (eg drawing for Architecture, etc.).

Study programmes in Higher Education Institutions last from four to six years, depending on the subject area. Students who successfully complete their studies are awarded a Ptychio / Diploma, which permits employment or further studies at post-graduate level leading to a Metaptychiako Diploma Eidikefsis (2nd cycle) - equivalent to the Master's degree- and to the doctorate degree (3d cycle), Didaktoriko Diploma.
Legislation on quality assurance in Higher Education, the Credit Transfer and Accumulation System (ECTS) and the Diploma Supplement defines the framework and the criteria for the evaluation of Higher Education Institutions, and for the certification of programmes of studies. These measures aim, among others, at promoting student mobility and contributing to the creation of the European Higher Education Area.

A detailed description of the Greek Education System is offered in:

- EURYDICE (<http://www.eurydice.org>) database of the European Education Systems.
- <http://eacea.ec.europa.eu/education/eurydice/documents/thematic_reports/122EN.pdf> (pages 82,83)



MAIN RESEARCH ACTIVITIES

The main areas of research activity ***at the AUTh School of Pharmacy*** *are:*

- Drug formulation.
- Pharmaceutical analysis.
- Design of drug delivery systems.
- Powder and tableting technology.
- Cosmetics Technology and Analysis.
- Pharmaceutical Natural Products Technology and Analysis.
- Dispersion and its Application in Formulation (Emulsions, micro-emulsions, micelles).
- Microencapsulation
- Quality Control (Bioequivalence etc.).
- Design, Synthesis, Physiochemical Properties of Bioactive Molecules and Correlations of Structure with Activity.
- Fate of Xenobiotics in the Organism, Pharmacochemical Approaches to Drug Metabolism, Molecular Approaches to Drug Interactions.
- Medicinal Chemistry of the Actions of Drugs and Chemicals. Chemistry of Molecular Mechanisms of Bioactivity.
- Medicinal Chemistry of Free Radicals, Approaches to Protection against Cell
- Degeneration.
- Design, Synthesis and Evaluation of Enzyme Inhibitors.
- Isolation of Plant-derived Natural Products (alkaloids, phenols, essential oils).
- Structure Identification of Products from Pharmaceutical Plants.
- Evaluation of Natural Products as Therapeutics.
- Biotechnology of pharmaceutical plants (cloning and characterization of genes of secondary metabolism, functional genomic analysis of glandular trichomes and molecular basis of glandular trichome morphogenesis).
- Nutritional genomics (ascorbic acid biosynthesis and oxidation and gene manipulation of arginine biosynthesis).
- Developmental Pharmacology of Therapeutics.
- Molecular Analysis of Leukemiogenesis and Hemopoiesis.
- Mechanism(s) of Antineoplastic Drug Action and Toxicity (structure-activity relationships, SAR).
- Development of Inducers and Differentiation Therapy of Cancer (Leukemia, Brain Tumors).
- Analysis of Pathophysiology and Therapy of Neurodegenerative diseases.
- Biochemical aspects of drug disposition and metabolism – Pharmacokinetics.

LIST OF TELEPHONE NUMBERS AND ELECTRONIC ADDRESSES OF THE STAFF OF THE SCHOOL OF PHARMACY

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