PHARMACEUTICAL CHEMISTRY

1. Information about the program

1.1.	UNIVERSITY: "GRIGORE T. POPA" UNIVERSITY OF MEDICINE AND PHARMACY OF IAȘI
1.2.	FACULTY: PHARMACY SCHOOL / DEPARTMENT: PHARMACEUTICAL SCIENCES I
1.3.	SUBJECT: PHARMACEUTICAL CHEMISTRY
1.4.	STUDY FIELD: HEALTH
1.5.	STUDY CYCLE: UNDERGRADUATE
1.6.	STUDY PROGRAMME: PHARMACY

2. Subject data

2.1.	SUBJECT: PHARMACEUTICAL CHEMISTRY						
2.2.	Module leader: Prof. Profire Lenuța, PhD						
2.3.	Seminar leader: Prof. Profire Lenuța, PhD, Lecturer Lupașcu Florentina, PhD, Assist. Pânzariu Andreea, PhD student						
2.4. Year of study	IV	2.5. Semester in which is taught	I/II	2.6. Evaluation type	E1/E2	2.7. Subject status	Compulsory

3. Duration of the course (hours per semester)

3.1. Number of hours / week	6 (1st sem) 5 (2nd sem)	3.2. Number of hours / week	2 (1st sem) 2 (2nd sem)	3.3. Seminar / lab	4 (1st sem) 3 (2nd sem)
3.4. Total number of learning hours	84 (1st sem) 70 (2nd sem)	3.5. Total number of learning hours	28 (1st sem) 28 (2nd sem)	3.6. seminar / lab	56 (1st sem) 42 (2nd sem)

3.7. Distribution of activities in the course (1st sem/2nd sem)	hours
Study based on the manual, printed course, bibliography and notes	28/25
Additional research in the library, on specialized e-platforms and field study	5/5
Preparation for seminars, practical courses, portfolios and essays	5/-
Tutoring	5/5
Assessment	23/20
Other activities	-
3.8. Number of hours of individual study	43/35
3.9. Number of hours per semester	150/125
3.10. Number of ECTS	6/5

4. Previous Knowledge (if applicable)

4.1. course related	Organic and inorganic chemistry, analytical chemistry, pharmacology.
4.2. skill related	Chemistry and pharmacology knowledge, titration.

5. Requirements (if applicable)

5.1. course conditions	Video projector.
5.2. seminar / laboratory conditions	Laboratory glass-ware, burettes, reagents, volumetric solutions, technical and analytical balances.

6. Specific Skills Acquired

Professional skills displayed by knowledge and skills	• Design and manufacture of medicines. • Analysis and control of medicines. • Consultancy and expertise in the field of medicines.
Transversal skills (role skills, professional and personal skills)	• Team work skills. • Using theoretical and practical knowledge to handle specific professional qualification problems. • Availability for continuous education, autonomy and liability.

7. Course Objectives (confirmed by the grid of specific skills acquired)

7.1. General Objective	The complex study of pharmaceutical substance - active principle of the drug- regarding common international name, chemical structure, synthesis methods, and chemical structure-biological activity relationships.
7.2. Specific Objectives	The knowledge of physico-chemical and pharmaco-toxicological properties, therapeutic uses and pharmaceutical products, in the following classes: General Anaesthetics, Sedatives and Hypnotics, Anxiolytics (Tranquilizers), Antipsychotics (Neuroleptics), Antiepileptics, Anti-Parkinsonian Drugs, Antidepressants, Psychmotor Stimulants, Nootropics, Opioid Analgesics, Local Anaesthetics, Analgesic-Antipyretic and Nonsteroid Anti-Inflammatory drugs (1st sem.)/ Pharmaceutical Substances Acting on Autonomic Nervous System: Sympathomimetics (Adrenergic drugs), Sympatholytics (Adrenolytic Drugs), Adrenergic Neural Blockers, Parasympathomimetics, Parasympatholytics; Pharmaceutical Substances acting on Cardiovascular System; Pharmaceutical Substances with Diuretic Action; Pharmaceutical Substances Acting on Blood, Histamine: Agonists and Antagonists; Pharmaceutical Substances acting on Respiratory System; Pharmaceutical Substances acting on Digestiv system; Antidiabetics; Antihyperlipidemics; Radiodiagnostic Substances (2nd sem.).

8. Contents

8.1. Course	**Teaching methods**	**Observations**

General Anaesthetics: Inhalatory Anesthetics. Intravenous Anesthetics. Barbituric and Thiobarbituric Acid Derivatives. Other Anesthetics	Video projector	2 hours
Sedatives and Hypnotics: Acyclic Ureides. Barbituric Derivatives. Quinazolone Derivatives. Imidazopyridines. Benzodiazepine Derivatives	Video projector	2 hours
Tranquilizers: Benzodiazepine Tranquilizers. Anxiolytics with an Azaspirodecandione Structure. 1,3- Propandiol Derivatives. Diphenylmethane Derivatives	Video projector	4 hours
Antipsychotics (Neuroleptics): Phenothiazine Derivatives. Thioxanthene Derivatives. Fluorobutyrophenone Derivatives. Diphenylbutilpiperidine Derivatives. Benzazepine Derivatives	Video projector	2 hours
Antiepileptics: Imidazolidine-2,4-dione Derivatives. Oxazolidin-2,4-dione Derivatives. Hexahydropyrimidine-4,6-dione Derivatives. Dibenzazepine Derivatives. Benzodiazepines	Video projector	2 hours
Anti-Parkinsonian Drugs: Anticholinergic Drugs. Dopamine-Receptor Agonists. Drugs Affecting Dopamine Metabolism	Video projector	2 hours
Antidepressants: Non-selective Monoamine Reuptake Inhibitors (Tricyclic Antidepressants). Selective Serotonin Reuptake Inhibitors. Monoaminooxidase Inhibitors (MAOI). "Atipic" Antidepressants. Lithium Derivatives	Video projector	2 hours
Psychmotor Stimulants: Methylxanthines. Phenylethylamine Derivatives. Nootropics: alfa-Pyrrolidones Derivatives	Video projector	2 hours
Opioid Analgesics: Morphinan Derivatives. Benzomorphan Derivatives. Phenylpiperidine Derivatives. Anilinopiperidines Derivatives. Heptan-3-one Derivatives. Cyclohexanol Derivatives	Video projector	2 hours
Local Anaesthetics: Benzoic Acid Esters. Para-Aminobenzoic Acid Esters. Amide-type Local Anaesthetics	Video projector	6 hours
Analgesic-Antipyretic and Nonsteroid Anti-Inflammatory drugs: Salicylic Acid Derivatives. Aryl and Heteroaryl Acetic Acid Derivatives. Aryl and Heteroaryl Propionic Acid Derivatives. Butyric Acid Derivatives. Anthranilic Acid Derivatives. 2-Amino-pyridine-3-carboxylic Acid Derivatives. Quinoline Derivatives. Hydroxamic Acid Derivatives. 5-Pyrazolone Derivatives. Pyrazolidin-3,5-dione Derivatives. Enolic Acids (Oxicames). Aniline Derivatives. Coxibs. Gold Salts. Gout Medication		
The Medication for Autonomic Nervous System: Sympathomimetics (Adrenergic Drugs). Vasoconstrictor Sympathomimetics. Peripheral Vasodilators. Tocolytic Sympathomimetics. Cardiac Stimulators Sympathomimetics. Sympathomimetic Bronchodilators. Other Sympathomimetics. Selective alpha-2 adrenoreceptor agonists. Sympatholytics. Alpha-adrenolytic Drugs. Beta-adrenolytic Drugs. Adrenergic Neural Blockers. Parasympathomimetics. Direct-acting parasympathomimetics. Indirect-acting parasym-	Video projector	10 hours

pathomimetics. Parasympatholytics. Semisynthetic and Synthetic Spasmolitics. Musculo-Spasmolytics. Pharmaceutical Substances Acting at Autonomic Ganglia. Pharmaceutical substances acting at Neuromuscular Junction	Video projector	6 hours
Pharmaceutical Substances Acting on The Cardiovascular System: Positive inotrop drugs. Drugs Active on Renin-Angiotensin System. Angiotensin Converting Enzyme (ACE) Inhibitors. Angiotensin II Receptor Antagonists.	Video projector	2 hours
Antiarrhythmic Agents. Calcium Channel Blockers. Coronarodilator Drugs. Cerebral and Peripheral Vasodilators Drugs	Video projector	3 hours
Pharmaceutical Substances with diuretic action		
Pharmaceutical Substances Acting on Blood: Antithrombotic Drugs. Anticoagulants. Heparine. Heparinoids. Hirudine and Derivatives. Low-molecular-weight Heparins. Oral anticoagulants. 4-Hydroxy-cumarine Derivatives. Indan-1,3-dione Derivatives. Thrombolytic Drugs (Fibrinolytics). Platelet Antiagregants. Hemostatics. Local Hemostatics. Systemic Hemostatics	Video projector	2 hours
Histamine. Agonists and Antagonists: H1 Receptor Histamine Antagonists. Aminoalkyl Ethers. Ethylenediamines. Dibenzo-cycloheptenes / Heptans. Second-Generation H1 Receptor Histamine Antagonists	Video projector	1 hour
Pharmaceutical Substances Acting on Digestiv System : Antiulcerant Drugs. Gastric Acid Secretion Inhibitors. H2 Receptor Histamine Antagonists. Proton Pump Inhibitors. Prostaglandin Antiulcerants. Gastric Protectors. Choleretics. Synthetic Purgatives. Antidiarrheals	Video projector	1 hour
Pharmaceutical Substances Acting on Respiratory System: Anticough Drugs. Expectorants. Mucolytics	Video projector	1 hour
Antidiabetics: Antidiabetic sulphonamides. Biguanidines. Other antidiabetics. Aldose Reductase Inhibitors. Carboxylic Acids. Cyclic Imides. Alpha-Glucosidase Inhibitors		
Drug Therapy for Hypercholesterolemia and Dyslipidemia: Fibrates. Statins. Nicotinic Acid and Analogues. Bile-Acid Resins. Radiodiagnostic Substances		

Bibliography

1. Wilson and Gisvolds. *Textbook of Organic Medicinal and Pharmaceutical Chemistry*. Philadelphia: Lippincott Williams and Wilkins, Xth edition, 1998.
2. *Martindale. The Complete Drug Reference*. A 33-a editie (editor Sean C. Sweetman), Pharmacetical Press, 2002.
3. ****The Merck Index. Encyclopedia of Chemicals, Drugs and Biologicals*, 13th edition. Merck and Co.Inc., USA, 2001.

8.2. Seminar / Practical lessons	**Teaching Methods**	**Observations**

General, Specific and Differentiation Chemical Reactions in Various Classes of Pharmaceutical Substances	teaching on blackboard, discourse	4 hours
Synthesis and Analysis of Pharmaceutical Substances from Hypnotic and sedative substances class	teaching on blackboard, discourse	17 hours
Synthesis and Analysis of Pharmaceutical Substances from Tranquilizers class	teaching on blackboard, discourse	4 hours
Synthesis and Analysis of Pharmaceutical Substances from Neuroleptics class	teaching on blackboard, discourse	2 hours
Synthesis and Analysis of Pharmaceutical Substances from Local anesthetics class	teaching on blackboard, discourse	10 hours
Synthesis and Analysis of Pharmaceutical Substances from Analgesic-Antipyretic and Nonsteroid Anti-Inflammatory drugs class	teaching on blackboard, discourse	11 hours
Synthesis and Analysis of Pharmaceutical Substances from Stimulants of CNS class	teaching on blackboard, discourse	8 hours
General, Specific and Differentiation Chemical Reactions in Various Classes of Pharmaceutical Substances	teaching on blackboard, discourse	8 hours
Synthesis and Analysis of Musculo-Spasmolytics	teaching on blackboard, discourse	4 hours
Synthesis and Analysis of Pharmaceutical Substances Acting on Digestive System	teaching on blackboard, discourse	7 hours
Synthesis and Analysis of Antiallergy drugs	teaching on blackboard, discourse	3 hours
Synthesis and Analysis of Pharmaceutical Substances with diuretic action	teaching on blackboard, discourse	4 hours
Synthesis and Analysis of Substances used in the treatment of Hypercholesterolemia and Dyslipidemia	teaching on blackboard, discourse	4 hours
Synthesis and Analysis of Radiodiagnostic Substances	teaching on blackboard, discourse	3 hours
Synthesis and Analysis of Aminoacids	teaching on blackboard, discourse	9 hours

Bibliography

1. Wilson and Gisvolds. *Textbook of Organic Medicinal and Pharmaceutical Chemistry*. Philadelphia: Lippincott Williams and Wilkins, Xth edition, 1998.
2. *Martindale. The Complete Drug Reference*. A 33-a editie (editor Sean C. Sweetman), Pharmacetical Press, 2002.
3. *********The Merck Index. Encyclopedia of Chemicals, Drugs and Biologicals*, 13th edition. Merck and Co.Inc., USA, 2001.

9. The agreement between the course contents and the expectations of the representatives of the epistemic communities, professional associations and employers in the field related to the program

In Pharmaceutical chemistry, students acquire complex knowledge about active substances – from information about the synthesis and the analysis to information about their biological properties. This knowledge is essential to exercise the pharmacist profession either in pharmacy, pharmaceutical labs or in pharmaceutical industry.

10. Assessment

Activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Percentage of the final grade
10.4. Course	Answers in the theoretical exam.	Written examination	50%
10.5. Seminar / Practical lessons	Testing during the semester.	Discourse and test papers	10%
	Answers and results in the practical exam.	Written examination	40%
Minimal standard of proficiency 5 is the lowest passing grade.			