

2024/2025. ACADEMIC YEAR	
PROGRAM OF STUDY (FOR STUDENTS OF 3RD YEAR)	
Full (Hun) name of the subject: Gyógyszerkémia és analízis I.	
Program: Undivided program (pharmaceutical)	
Schedule: full-time	
Short name of the subject:	
English name of the subject: Pharmaceutical Chemistry and Analysis I.	
German name of the subject: Pharmazeutische Chemie und Analytik I	
Type of registration: obligatory/obligatory elective/elective/criteria requirement	
Neptun code of the subject: GYKGYK279E1A	
Responsible Department: Department of Pharmaceutical Chemistry	
Responsible tutor Dr. György Tibor Balogh Contact information: Semmelweis University, Department of Pharmaceutical Chemistry 1092 Budapest, Hőgyes Endre u. 9. - phone: 06-1-217-0891 - email: balogh.gyorgy.tibor@semmelweis.hu	Title, academic degree: Head of department, DSc, PhD, dr. habil
Name of the persons responsible for the teaching of the subject: Dr. György Tibor Balogh Dr. Péter Horváth Dr. Károly Mazák Dr. Márta Kraszni Dr. Gergő Tóth Dr. Arash Mirzahosseini Dr. Ádám Golcs Dr. Tamás Pálla Dr. Réka Angi Dr. Vivien Bárdos Dr. Balázs Simon Dr. Rita Szolláth Anna Vincze	Title, academic degree: Head, full professor, PhD Associate professor, PhD Associate professor, PhD Associate professor, PhD Associate professor, PhD Adjunct, PhD Adjunct, PhD Adjunct, PhD Adjunct, PhD Assistant professor Assistant professor Assistant professor Assistant professor
Class per week: 4 lectures 4 practices	Credit point(s): 8
Professional content, intent of acquirement and its function in order to implement the goals of the program: Integration of the curriculum of various chemical and biological courses and extension with specific chemical knowledge regarding properties, mechanism of action and analytics of drug substances.	
Short description of the subject: theory: Teaching of synthesis, analytics, physico-chemical and chemical properties, structure-activity relationships, receptor-bindings and biochemical background of biological effects of drug substances. practice: Teaching of analytics, physico-chemical and chemical properties of drug substances.	
Course data	

Recommended term	Contact hours (lecture)	Contact hours (practice)	Contact hours (seminar)	Individual lectures	Total number of contact hours/semester	Normal course offer	Consultations
5	56	56			112	<u>Autumn semester*</u> Spring semester Both semesters (* Please underline)	

Program of semester**

Topics of theoretical classes (pro week):

Week	
1	Introduction. (Pharmaceutical Chemistry, Pharmacopoeias) Preliminary testing of inorganic and organic compounds, classification Methods for identification of inorganic compounds Identification of organic functional groups
2	General purity tests in Pharmacopoeia Structural and physical chemistry of drug action I
3	Proton speciation of drugs, Determination of protonation constants, optimization of pH-dependent processes Characterization of lipophilicity, determination of partition coefficient
4	The role of solubility in drug discovery. Kinetic and thermodynamic solubility and methods of determination Role of active substance permeability in ADME processes
5	Separation techniques TLC and HPLC Application of UV-VIS spectrophotometry in the analysis of drugs
6	Determination of organic acids and bases Major analgetics I.
7	Major analgetics II. Minor analgetics
8	Minor analgetics Nonsteroidal antiinflammatory drugs
9	Narcotics Sedato-hypnotics and anxiolytics
10	Local anaesthetics Psychopharmacons I.
11	Psychopharmacons II. Cholinergic and adrenergic agents I.
12	Cholinergic and adrenergic agents II. Cholinergic and adrenergic agents III.
13	Drugs acting on the digestive system Antiepileptics
14	Drug discovery and research Drug discovery and research

Topics of practical classes (pro week):

1. week: Equipping, rules to be observed in the laboratory Burning test demonstration and discussion.
2. week: Preliminary testing and classification of inorganic and organic drugs. Identification of inorganic drugs
3. week: Burning and other preliminary tests with model compounds.
4. week: General purity tests for inorganic ions I
5. week: Determination of protonation constants (potentiometry, UV spectroscopy)
6. week: Determination of organic functional groups
7. week: Major analgetics
8. week: Minor analgetics
9. week: Non-steroidal anti-inflammatory drugs
10. week: Determination of logP
11. week: Local anesthetics
12. week: Sedato-hypnotics, anxiolytics
13. week: Drugs effecting the vegetative nervous system
14. week: Psychopharmacons

Other subjects (both compulsory and optional) relating to the transversal issues of the subject. Possible overlaps between subjects:**Schedule of consultations:*****Course requirements***

Prerequisites: Analytical Chemistry II., Organic Chemistry II.

Conditions of attending the classes, amount of acceptable absents, way of presentation of leave, opportunity for makeup:

Based on the Study and Examination Regulation

The grading method; the conditions for getting the signature; the number, topic(s) and date(s) of the mid-term assessments, (reports, term tests), and the process in which they contribute to the final grade; and the possibility of their retake or their upgrading retake (as provided in §§ 25-28 of the STUDY AND EXAMINATION REGULATIONS):

Project reports on weeks 5, (retake on week 7); 10 (retake on week 12); and 14.

Possibility of substitutions according to the thematic plan issued at the beginning of the semester

The average of the project report papers written during the semester counts for 1/3 of the exam mark, while the result of the colloquium counts for 2/3.

Requirements of signature (as provided for in STUDY AND EXAMINATION REGULATIONS § 29):

Attendance of lectures. (Extent of the absence is based on the Study and Exam Regulation)

Attendance of practices. (Extent of the absence is based on the Study and Exam Regulation)

The average of the scheduled project reports is at least 2 without rounding.

The required minimum amount of points during practices is accumulated.

Number and type of projects students have to perform independently during the semester and their deadlines:

Type of the semester-end examination: signature*/practical grade*/ comprehensive examination*/final/**end-term examination***

* Please underline

Examination requirements: (list of topics, test examination topics, mandatory parameters, diagrams, concepts, list of calculations, practical skills, and project tasks recognised as examinations, criteria for completion and assessment):

Identification of inorganic compounds

(identification of anions and cations in Ph. Eur.)

Identification of organic functional groups

(identification of acidic, basic and neutral functional groups; identification of phenols; identification of amine functional groups)

Purity tests in Ph. Eur.

(principles, classification of impurities; general tests for ammonium, arsenic, phosphate, calcium, potassium, chloride, magnesium, sulphate, iron and heavy metals; clarity and degree of opalescence, colour of liquids; calculations)

Structural and physical chemistry of drug action

(general description of drug action; description of acid-base character; requirements of the formation of the drug-target molecule complex, types of drug-target molecule interactions, characterization of drug-target molecule interactions, types of the biological response)

Protonspeciation of drugs

(macro- and microconstants /logK, pKa/, relationships; determination of the concentration of species; \bar{n} , \bar{H} , average charge, isoelectric point; calculations)

Determination of protonation macroconstants

(direct potentiometry, UV/pH titrations; calculations)

Lipofilarity, solubility, permeability

(definitions, relationships; experimental methods; calculations of logP, logD, logS, kinetic and thermodynamic solubility, effects acting on solubility, biological and artificial membranes, transport processes, sink process)

UV/VIS spectroscopy

(theoretical principles; chromophore and auxochrom groups; spectrum shifts; Lambert-Beer law; practice of spectrophotometric measurement; pharmacopoeial applications;)

Chromatographic methods, TLC, HPLC

(classification of chromatographic systems; principles; stationary- and mobile phases; TLC: practice of TLC, R_f, R_M, pharmacopoeial applications, validation; HPLC: apparatus, principles, definitions, chromatogram, chromatographic parameters (dead time, retention time, capacity factor, resolution, selectivity), pharmacopoeial applications)

Determination of organic acids and bases

(classification of solvents; measurement options with examples, calculations, multicomponent drug preparations)

Major analgetics

(classification; structure, properties and analytics of morphine; semi-synthetic agents, structure-activity relationships; synthetic opioid compounds; receptor model; (structures: morphine, codeine, ethylmorphine, dihydrocodeine, oxycodone, naloxone, naltrexone, nalbuphine, dextrometorphan, pentazocine, pethidine, fentanyl, methadone, tramadol)

Minor analgetics

(classification; properties, analytics, metabolism; structures: salicylic acid, sodium salicylate, acetylsalicylic acid, paracetamol, phenazone, aminophenazone, metamizole sodium)

Nonsteroidal anti-inflammatory drugs

(mechanism of action; classification; structures, properties, analytics, structure-activity relationships; structures: niflumic acid, diclofenac, indometacin, ibuprofen, naproxen, phenylbutazone, piroxicam, celecoxib, nimesulide)

Local anaesthetics

(mechanism of action; classification; structures, properties, analytics; structures: cocaine, benzocaine, procaine, tetracaine, lidocaine, mepi-, ropi-, bupivacaine, articaine)

General anaesthetics

(classification; structures, structural criteria of action, partition equilibria, properties, structure-activity relationships; structures: isoflurane, desflurane, sevoflurane, propofol)

Sedato-hypnotics

<p>(classification; structure, properties, analytics, mechanism of action and structure-activity relationships of barbiturates; structures: chloral hydrate, chlorobutanol, barbital, phenobarbital, hexobarbital, thiopental)</p> <p>Anxiolytics (classification; structure, properties, mechanism of action and structure-activity relationships of benzodiazepines; structures: nitrazepam, diazepam, oxazepam, chlordiazepoxide, medazepam, midazolam, alprazolam)</p> <p>Antipsychotics (classification; structure, properties, mechanism of action, structure-activity relationships of phenothiazines and thioxanthenes; structure, properties and mechanism of action of atypical antipsychotics (benzamides, tricyclic compounds, aryl-piperazines; (structures: chlorpromazine, levomepromazine, thioridazine, fluphenazine, fluphenazine decanoate, chlorprothixene, flupentixol, sulpiride, clozapine, quetiapine)</p> <p>Antidepressants (classification; structure, properties, mechanism of action, structure-activity relationships of I. and II. generation drugs; structures: imipramine, amitriptyline, maprotiline, fluoxetine, sertraline)</p> <p>Parasympathomimetics (receptors, receptor binding of acetylcholine; classification; structure, properties, analytics, structure-activity relationships of direct and indirect acting parasympathomimetics; structure: acetylcholine, carbachol, pilocarpine, physostigmine, neostigmine, pyridostigmine)</p> <p>Parasympatholytics (classification; structure, properties, receptor binding, analytics, structure-activity relationships of natural and synthetic parasympatholytics; structures: atropine, scopolamine, homatropine, homatropine methylbromide, ipratropine, thiotropium)</p> <p>Sympathomimetics (receptors, receptor binding of noradrenaline; classification; structure, properties, analytics and structure-activity relationships of phenylalkylamines; structures: noradrenaline, adrenaline, isoprenaline, dobutamine, terbutaline, salbutamol, phenylephrine, ephedrine, naphazoline)</p>
<p>Form of the semester-end examination: <u>written</u>*/oral*/combined examination/practical examination/the assessment of completing project work (according to STUDY AND EXAMINATION REGULATIONS 30.§)* (<i>Please underline</i>)</p>
<p>The possibility and conditions for offering grades:</p> <p>No grades offered</p>
<p>A list of the basic notes, textbooks, resources and literature that can be used to acquire the knowledge necessary to master the curriculum and to complete the assessments, ****-with exact description about which of them is required to acquire which part of the syllabus (e.g. description based on topics)), as well as the main technical and other aids and study aids that can be used:</p> <p>Theoretical and practical material uploaded to Moodle system. Lecture notes Foye's Principles of medicinal chemistry</p>
<p>In the case of a subject lasting more than one semester, the position of the teaching/research department on the possibility of parallel enrolment and the conditions for admission****:</p> <p>yes*/<u>no</u>*/on and individual assessment basis* (<i>Please underline</i>)</p>
<p>The course description was prepared by:</p> <p>Dr. Péter Horváth</p>

**** A tantárgy tematikáját oly módon kell meghatározni, hogy az lehetővé tegye más intézményben a kreditismerési döntéshozatalt, tartalmazza a megszerzendő ismeretek, elsajátítandó alkalmazási (rész)kézségek, (rész)kompetenciák és attitűdök leírását, reflektálva a szak képzési és kimeneti követelményeire.**