BULLETIN

UNIVERSITY OF DEBRECEN

ACADEMIC YEAR 2016/2017

FACULTY OF PHARMACY

Coordinating Center for International Education

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CHAPTER 1
INTRODUCTION

The aim of the University of Debrecen is to become a university of medical sciences committed to the prevention and restoration of health of the people, not only in its region but in the entire country.

In the past two decades both medical science and health care have entered a new era: the medical science of the 21st century. Molecular medicine is opening up and new possibilities are available for the diagnosis, prevention, prediction and treatment of the diseases. One can witness such a progress in medical sciences that has never been seen before. Modern attitudes in health care should be enforced in practice, including therapeutical approaches that consider the explanation and possible prevention of diseases, and attempt to comprehend and take the human personality into consideration. These approaches demand the application of the most modern techniques in all fields of the medical education.

All curricula wish to meet the challenges of modern times and they embody some very basic values. They are comprehensive; they take into consideration the whole human personality (body and soul) in its natural and social surroundings; and they are based upon the best European humanistic traditions. Moreover, all curricula prepare students for co-operation and teamwork.

With respect to education, both students and teachers are inspired to acquire higher levels of professionalism, precision, and problem solving skills, upon which the foundations of specialist training and independent medical practice can be built. This approach enables the assimilation of new scientific developments, facilitating further education and the continuous expansion of knowledge. The interplay of these factors ensures the ability to understand and handle the changing demands of health care.

With respect to research, the faculty members continuously acquire, internalize and subsume new knowledge, especially concerning the genesis, possible prevention and treatment of diseases. Moreover, new information aimed at improving, preserving and restoring the health of the society is also absorbed. The University of Debrecen is already internationally recognized in the fields of both basic and clinical research, and the clinicians and scientists of the University are determined to preserve this achievement. Special attention is given to facilitate and support the close co-operation of researchers representing basic science and clinical research, and/or interdisciplinary studies.

With respect to therapeutic practice, the main objective is to provide high quality, effective, up to date and much devoted health care to all members of the society, showing an example for other medical institutions in Hungary. One of the primary tasks is to continuously improve the actual standards of the diagnostic and therapeutic procedures and techniques, and to establish regional or even nationwide protocols.

With respect to serving the community, all faculty members wish to play a central role in shaping the policies of the health service; both within the region and in Hungary. They also want to ensure that sufficient number of medical doctors, dentists and other health care experts with university education is provided for the society.

With respect to the development, all employees strive for reinforcing those features and skills of the lecturers, scientists, medical doctors, health care professionals, collaborators and students which are of vital importance in meeting the challenges of medical education, research and therapy of the 21st century. These include humanity, empathy, social sensitivity, team-spirit, creativity, professionalism, independence, critical and innovative thinking, co-operation and management.

The organizational structure, including the multi-faculty construction of the institution, is a constantly improving, colorful educational environment, in which co-operation is manifest between the individual faculties and colleges, the various postgraduate programs as well as the molecular-and medical biology educations.

HIGHER EDUCATION IN DEBRECEN

A Brief History

1235: First reference to the town of Debrecen in ancient charters.
1538: Establishment of the “College of Reformed Church” in Debrecen.
1567: Higher education begins in the College.
1693: Declaration of Debrecen as a “free royal town”.
1849: Debrecen serves as the capital of Hungary for 4 months.
1912: Establishment of the State University of Debrecen comprising the Faculties of Arts, Law, Medicine and Theology.
1918: Inauguration of the Main Building of the Medical Faculty by King Charles IV of Hungary.
1921: The Medical Faculty becomes operational.
1932: Completion of buildings of the campus.
1944: Although during the Second World War, Debrecen became the capital of Hungary again (for 100 days), the University itself is abandoned for a while.
1949: The only year when the University has five faculties.
1950: The Faculty of Law idles; the Faculty of Science is established.
1951: The University is split up into three independent organizations: Academy of Theology, Medical School, Lajos Kossuth University of Arts and Sciences.
1991: The “Debrecen Universitas Association” is established.
1998: The “Federation of Debrecen Universities” is founded.
2000. The federation is transformed into the unified “University of Debrecen” with all the relevant faculties and with some 20,000 students.

Debrecen is the traditional economic and cultural center of Eastern Hungary. In the 16th century Debrecen became the center of the Reformed Church in Hungary and later it was referred to as the "Calvinist Rome". The 17th century was regarded as the golden age of the city because Debrecen became the mediator between the three parts of Hungary: the part under Turkish occupation, the Kingdom of Hungary and the Principality of Transylvania. For short periods of time, Debrecen served twice as the capital of Hungary. Nowadays, with its population of approximately a quarter of a million, it is the second largest city in Hungary.
Debrecen is a unique city: although it has no mountains and rivers, its natural environment is rather interesting. One of the main attractions and places of natural uniqueness in Hungary is Hortobágy National Park, known as “puszta" (“plain”), which begins just in the outskirts of Debrecen. This is the authentic Hungarian Plain without any notable elevations, with unique flora and fauna, natural phenomena (e.g. the Fata Morgana), and ancient animal husbandry traditions. The region is unmatched in Europe, no matter whether one considers its natural endowments or its historic and ethnographic traditions. A very lovely part of Debrecen is the “Nagyerdő” (“The Great Forest”), which is a popular holiday resort. Besides a number of cultural and tourist establishments, luxurious thermal baths and spas, Nagyerdő accommodates the University campus too.
The history of higher education in Debrecen goes back to the 16th century when the College of the Reformed Church was established. The University Medical School of Debrecen has its roots in this spiritual heritage. It was in the year of the millennium of the establishment of Hungary (1896) when the foundation of the present University was decided. The University of Debrecen was established in 1912, initially having four faculties (Faculties of Arts, Law, Medicine and Theology). The University was officially inaugurated by King Charles IV of Hungary on October 23rd, 1918.
The educational activity at the University started in 1924, although the construction of the whole University was completed only in 1932. In 1951 the Faculty of Medicine became a self-contained,

independent Medical University for training medical doctors.
The special training of dentists began in 1976. As a further development the University Medical School established the Health College of Nyíregyháza in 1991. In 1993, as part of a nationwide program, the University was given the rights to issue scientific qualifications and new Ph.D. programs were also launched. Several new programs (e.g. the training of molecular biologists, pharmacists, general practitioners) were commenced in the ’90s. The Faculty of Public Health was established in 1999, while the Faculty of Dentistry was founded in 2000.
The Faculty of Medicine celebrated the 90th anniversary of its foundation in October 2008 with a highly successful international scientific conference.

Education at the University of Debrecen
Debrecen, the second largest city of Hungary, is situated in Eastern Hungary. Students enrolled in the various programs (e.g. Medicine, Dentistry, Pharmacy, Public Health, Molecular Biology, etc.) study on a beautiful campus situated in the area called “Great Forest”.
The Hungarian Government gives major priorities to the higher education of health sciences in its higher education policy. One of these priorities is to increase the ratio of college level training forms within the Hungarian higher education system. The governmental policy wishes to implement conditions in which the whole health science education system is built vertically from the lowest (post-secondary or certificate) to the highest (PhD-training) levels. In fact, this governmental policy was the reason behind the establishment of the new Health Science Education Center within the Federation of Debrecen Universities (DESZ), based partially on the intellectual resources of the University of Debrecen. The new programs – with specialized training for paramedics – will help to correct the balance of the Hungarian labor-market that became rather unsettled in the past few decades.
The Act of Higher Education (1993) has restored the rights of the medical universities to award postgraduate degrees and residency, and permission was also given to license Physicians’ procedures. This kind of training required a new structure, a new administrative apparatus, and a suitable training center. The new residency programs were commenced in 1999.
The introduction of the credit system, starting in September 2003, has been mandatory in every Hungarian university, helping the quantitative and qualitative evaluation of the students’ achievements. Admission requirements for Hungarian students are defined at national level, and they are applicable for every student wishing to be enrolled into the Medicine or Dentistry programs.
International students must pass an entrance exam in biology and (depending on their preference) in physics or chemistry. In some special cases it may be possible for the candidates to apply for transfer to higher years on the basis of their previous studies and achievements. International students study in English language. Entrance for certain courses of the Health College is also possible on the basis of a special evaluation (scoring) and an entrance interview.
The syllabuses and classes of all courses correspond to European standards. The total number of contact hours in medical education is over 5,500, which can be divided into three main parts: basic theoretical training (1st and 2nd year), pre-clinical subjects (3rd year) and clinical subjects (4th and 5th year) followed by the internship (6th year). The proportion of the theoretical and practical classes is 30% to 70%; whereas the students/instructors ratio is about 8/1. The first two years of dentistry education are similar to the medicine program, but the former contains a basic dental training that is followed by a three-year-long pre-clinical and clinical training. Besides the medicine and dentistry programs, there are several other courses also available, including molecular biology. The various Health College courses include more and more new curricula.
The Medicine program delivered in English and intended for international students was commenced in 1987; whereas the Dentistry and Pharmacy programs for international students started in 2000

and 2004, respectively. The curriculum of the English language Medicine program meets all the requirements prescribed by the European medical curriculum, which was outlined in 1993 by the Association of Medical Schools in Europe. Compared to the Hungarian program, the most important differences are:
-Hungarian language is taught,
-More emphasis is laid upon the tropical infectious diseases (as parts of the “Internal Medicine” and “Hygiene and Epidemiology” courses).
Otherwise, the English language curriculum is identical with the Hungarian one. The 6th year of the curriculum is the internship that includes Internal Medicine, Pediatrics, Surgery, Obstetrics and Gynecology, Neurology, and Psychiatry. The completion of these subjects takes at least 47 weeks, although students are allowed to finish them within a 24-month-long period. The successfully completed internship is followed by the Hungarian National Board Examination. Just like the rest of the courses, the internship is also identical in the Hungarian and English programs.
A one-year-long premedical (Basic Medicine) course, which serves as a foundation year, is recommended for those applicants who do not possess sufficient knowledge in Biology, Physics and Chemistry after finishing high school.
After graduation, several interesting topics are offered for PhD training, which lasts for three years. If interested, outstanding graduates of the English General Medicine and Dentistry programs may join these PhD courses (“English PhD-program”). Special education for general practitioners has been recently started and a new system is in preparation now for the training of licensed physicians in Debrecen.

The accredited PhD programs include the following topics:
-Molecular and Cell Biology; Mechanisms of Signal Transduction
-Microbiology and Pharmacology
-Biophysics
-Physiology-Neurobiology
-Experimental and Clinical Investigations in Hematology and Hemostasis
-Epidemiological and Clinical Epidemiological Studies
-Cellular- and Molecular Biology: Study of the Activity of Cells and Tissues under Healthy and Pathological Conditions
-Immunology
-Experimental and Clinical Oncology
-Public Health
-Preventive Medicine
-Dental Research

The PhD-programs are led by more than 100 accredited, highly qualified coordinators and tutors.

Medical Activity at the Faculty of Medicine
The Faculty of Medicine is not only the second largest medical school in Hungary, but it is also one of the largest Hungarian hospitals, consisting of 49 departments; including 18 different clinical departments with more than 1,800 beds. It is not only the best-equipped institution in the area but it also represents the most important health care facility for the day-to-day medical care in its region.
The Kenézy Gyula County Hospital (with some 1,400 beds) is strongly affiliated with the University of Debrecen and plays an important role in teaching the practical aspects of medicine. There are also close contacts between the University and other health care institutions, mainly (but not exclusively) in its closer region. The University of Debrecen has a Teaching Hospital Network consisting of 24 hospitals in Israel, Japan and South Korea.

It is also of importance that the University of Debrecen has a particularly fruitful collaboration with the Nuclear Research Institute of the Hungarian Academy of Sciences in Debrecen, allowing the coordination of all activities that involve the use of their cyclotron in conjunction with various diagnostic and therapeutic procedures (e.g. Positron Emission Tomography 'PET').

Scientific Research at the Faculty of Medicine

Scientific research is performed both at the departments for basic sciences and at the laboratories of clinical departments. The faculty members publish about 600 scientific papers every year in international scientific journals. According to the scientometric data, the Faculty is among the 4 best of the more than 80 Hungarian research institutions and universities. Lots of scientists reach international recognition, exploiting the possibilities provided by local, national and international collaborations. Internationally acknowledged research areas are Biophysics, Biochemistry, Cell Biology, Immunology, Experimental and Clinical Oncology, Hematology, Neurobiology, Molecular Biology, Neurology, and Physiology. The scientific exchange program involves numerous foreign universities and a large proportion of the faculty members are actively involved in programs that absorb foreign connections (the most important international collaborators are from Belgium, France, Germany, Italy, Japan, the UK and the USA).

CHAPTER 2
PHARMACIST-TRAINING AT THE UNIVERSITY OF DEBRECEN

Pharmacist-training at the University of Debrecen

The establishment of the Faculty of Pharmacy at the University of Debrecen serves continuous development, change, renewal, and also reputation and prestige both nationally and internationally. At the University of Debrecen the organization and formation of pharmacist-training was started by Professor Géza Mezey in 1995, as a result of which in 1996 the teaching of the first year was launched in the field of pharmacist-training at the those days separately functioning Lajos Kossuth University of Sciences and Debrecen University of Medical Sciences. For the establishment and building of the Institute of Pharmaceutical Sciences (2001) the outstanding cooperation, effort, compromise approach, and continuous support of the management of the former Debrecen University of Medical Sciences and Lajos Kossuth University of Sciences were inevitable. Without these and the active assistance and collaboration of the colleagues and the university's management, the Faculty of Pharmacy could not have been in its current form and developed for the 100th year jubilee anniversary of establishment of the University of Debrecen. The coordination and improvement of the pharmacist-training was further concentrated into the hands of Professor Géza Mezey, the director of the Institute of Pharmaceutical Sciences (2001), until his death (17October, 2001).

The main building of the present Faculty of Pharmacy, where the Center's Pharmacy and the Dean's Office had been placed, was handed over in 2001 and the new building fully satisfies in every way the widespread supply of medicinal products towards the departments of the University of Debrecen and meets the requirements of pharmacist-training according to the standards of the European Union. Without the previous and present management of the University, the devoted help and cooperation of the departments belonging to the Faculty of General Medicine and the former Faculty of Natural Sciences at Lajos Kossuth University of Sciences where the acquisition of the basic subjects of Chemistry and Biology is ensured for the students of Pharmacy, the pharmacist-training would not have become possible at the University of Debrecen. The Hungarian anthem was first played in 2001 as this was the first year when pharmacist degrees were awarded at the ceremonial council meeting of the University of Debrecen. With the support and guidance of the management of that time and of he president of the Medical and Health Science Center, the draft for the accreditation of the Institute of Pharmaceutical Sciences to become a faculty was prepared. In 2003 it was approved by the Hungarian Accreditation Committee and from this year on the Faculty of Pharmacy started to operate as a separate organizational unit at the University of Debrecen, as its eleventh faculty. One of the fundamental prerequisites for the Institute of Pharmaceutical Sciences to become a faculty was to establish at least five independent departments. The University fulfilled this basic requirement by the founding of the Department of Pharmaceutical Technology (1996), Pharmacology (1998), Pharmaceutical Management and Organization (1999), Biopharmacy (2000), Pharmaceutical Chemistry (2001), Clinical Pharmacology (2001), and thus increased the number of its departments to six. In 2011 the number of departments at the Faculty of Pharmacy increased again as TEVA and the University of Debrecen Medical and Health Science Center's Faculty of Pharmacy founded the "of Industrial Pharmaceutics" that strengthens the practical education for the students during the training of pharmacist doctors.

The Faculty of Pharmacy successfully joined the University's Ph.D. training within the framework of the scheduled programs of the doctorate schools.

After successfully turning into faculty, we prepared the thematics of the English language pharmacist-training, and successfully launched the English language training (2004) for the foreign students of Pharmacy – which has already had considerable traditions at the fields of medical doctor

and dentist training at the University of Debrecen. There are more and more foreign students applying for the English language program, at present the number per year exceeds 25 persons.
Being grateful for the efforts of Professor Géza Mezey, the Faculty commemorates him with honor through the Dr. Géza Mezey Foundation named after him. The Advisory Board of the Géza Mezey Foundation and the Dean of the University of Debrecen's Faculty of Pharmacy have been awarding commemorative medals each year since 2003 for outstanding scholastic records, outstanding contributions to the student scientific society, and also as the acknowledgement of effective education.

CHAPTER 3
ORGANISATION STRUCTURE

RECTOR OF THE UNIVERSITY OF DEBRECEN	
Rector	Zoltán Szilvássy M.D., Ph.D., D.Sc.
Address	4032 Debrecen, Egyetem tér 1.
Phone	+36-52-416-060
Phone/fax	+36-52-416-490
E-mail	rector@unideb.hu
COORDINATING CENTER FOR INTERNATIONAL EDUCATION	
Director	Attila Jenei M.Sc., Ph.D.
Address	4032, Debrecen, Nagyerdei krt. 94.
Phone	+36-52-258-058
Fax	+36-52-414-013
E-mail	info@edu.unideb.hu
FACULTY OF MEDICINE	
Dean	László Mátyus M.D., Ph.D., D.Sc.
Address	4032, Debrecen, Nagyerdei krt. 98.
Phone	+36-52-258-086
Fax	+36-52-255-150
E-mail	dekan@med.unideb.hu
Vice Dean of General Affairs	Zoltán Szekanecz M.D., Ph.D., D.Sc.
Address	4032, Debrecen, Nagyerdei krt. 98.
Phone	+36-52-255-091
Fax	+36-52-255-091
E-mail	dekan@med.unideb.hu
Vice-Dean for Educational Affairs	Zoltán Papp M.D., Ph.D., D.Sc.
Address	4032, Debrecen, Nagyerdei krt. 98.
Phone	+36-52-255-978

Fax	+36-52-255-978
E-mail	dekan@med.unideb.hu

Vice-Dean of Scientific Affairs	László Virág M.D., Ph.D., D.Sc.
Address	4032, Debrecen, Nagyerdei krt. 98.
Phone	+36-52-417-345
Fax	+36-52-412-566
E-mail	dekan@med.unideb.hu

Dean's advisor	Endre Nagy M.D.,Ph. D., D.Sc.
Address	4032, Debrecen, Nagyerdei krt. 98.
Phone	+36-52-417-717/54166
Fax	+36-52-419-807
E-mail	dekan@med.unideb.hu

DEAN'S OFFICE OF THE FACULTY OF MEDICINE

Head of Directory Office	Katalin Juhász M.A.
Address	4032, Debrecen, Nagyerdei krt. 98.
Phone/Fax	+36-52-258-085, +36-52-255-150
E-mail	kjuhasz@edu.unideb.hu

REGISTRAR'S OFFICE

Head of Registrar's Office	Csilla Kerékgyártó M.D.
Address	4032, Debrecen, Nagyerdei krt. 94.
Phone/Fax	+36-52-258-001
E-mail	kerekgy@med.unideb.hu

FACULTY OF DENTISTRY

Dean	Csaba Hegedűs M.D., L.D.S., Ph.D.
Address	4032 Debrecen, Nagyerdei krt. 98.
Phone/Fax	+36-52-255-208
E-mail	hegedus.csaba.prof@dental.unideb.hu

Vice-Dean for Educational Affairs	István Tornai M.D., Ph.D.
Address	4032 Debrecen, Nagyerdei krt. 98.
Phone/Fax	+36-52-255-208
E-mail	itornai@med.unideb.hu
Vice-Dean for General Affairs	Pál Redl M.D., L.D.S., Ph.D.
Address	4032 Debrecen, Nagyerdei krt. 98.
Phone/Fax	+36-52-255-208
E-mail	redl.pal@dental.unideb.hu

FACULTY OF PHARMACY

Dean	Miklós Vecsernyés Pharm.D., Ph.D., D.Sc.
Address	4032 Debrecen, Nagyerdei krt. 98.
Phone/Fax	+36-52-411-717/54033
E-mail	vecsernyes.miklos@pharm.unideb.hu
Vice-Dean For General and Development Affairs	Gábor Halmos Pharm.D, Ph.D
Address	4032 Debrecen, Nagyerdei krt. 98.
Phone/Fax	+36-52-411-600/55292
E-mail	halmos.gabor@pharm.unideb.hu
Vice-Dean for Educational Affairs	Ildikó Bácskay Pharm.D., Ph.D.
Address	4032 Debrecen, Nagyerdei krt. 98.
Phone/Fax	+36-52-411-600/54034
E-mail	bacskay.ildiko@pharm.unideb.hu

FACULTY OF PUBLIC HEALTH

Dean	Margit Balázs MSc., Ph.D., D.Sc.
Address	4028 Debrecen, Kassai út 26/b.
Phone	+36-52-460-194
Fax	+36-52-460-195
E-mail	balazs.margit@sph.unideb.hu
Vice-Dean	Attila Bánfalvi MA., Ph.D.

Address	4032, Debrecen, Móricz Zsigmond. krt. 22.
Phone	+36-52-411-600
Fax	+36-52-255-487
E-mail	banfalvi.attila@sph.unideb.hu

FACULTY OF HEALTH

Dean	Imre Semsei, D.Sc.
Address	4400 Nyíregyháza, Sóstói u. 2-4.
Phone	+36-42-598-235
Fax	+36-42-408-656
E-mail	dekan@foh.unideb.hu

Vice-Dean for Scientific Affairs	János Kiss Ph.D.
Address	4400 Nyíregyháza, Sóstói út 2-4.
Phone	+36-42-598-235
Fax	+36-42-408-656
E-mail	kiss.janos@foh.unideb.hu

Vice-Dean for Educational Affairs	Attila Sárváry Ph.D.
Address	4400 Nyíregyháza, Sóstói út 2-4.
Phone	+36-42-598-235
Fax	+36-42-408-656
E-mail	sarvary.attila@foh.unideb.hu

Vice-Dean for General and Development Affairs	Gergely Fábián Ph.D.
Address	4400 Nyíregyháza, Sóstói út 2-4.
Phone	+36-42-598-235
Fax	+36-42-408-656
E-mail	fabian.gergely@csello.hu

FOREIGN MEDICAL STUDENT ASSOCIATION (FMSA)

Address	4032 Debrecen, Móricz Zsigmond krt. 22. III.sz. Markusovszky Kollégium
Phone	+36-52-411-717/55376

Fax	+36-52-255-028
Internet	www.fmsa.hu
E-mail	info@fmsa.hu

KENÉZY LIFE SCIENCES LIBRARY

Address	4032 Debrecen, Egyetem tér 1.
Phone/Fax	+36-52-518-610, +36-52-518-605
E-mail	kenezy@lib.unideb.hu
Internet	http://kenezy.lib.unideb.hu

CHAPTER 4
ADMINISTRATIVE UNITS

REGISTRAR'S OFFICE

Nagyerdei krt. 94., Debrecen, 4032, Tel: +36-52-258-020
E-mail: eduoffice@med.unideb.hu;info@med.unideb.hu

Head of Registrar's Office	Ms.	Csilla Kerékgyártó M.D.
Vice-Head of Registrar's Office	Ms.	Edit Fábián M.A.
Secretary	Ms.	Tünde Fekete M.Sc.
English Program Officer	Ms.	Zsófia Galaczi M.A.
		Ádám Richárd Jasák B.A.
	Ms.	Éva Ludánszki
	Ms.	Réka Rónai M.Sc.
Hungarian Program Officer	Ms.	Marianna Baloghné Holhós M.A.
	Ms.	Zsuzsa Barta B.A.
		Tamás Buka M.A.
	Ms.	Judit Derzsi M.A.
	Ms.	Anikó Karcza B.Sc.
	Ms.	Alexandrea Kulcsár-Szemán M.Sc.
	Ms.	Réka Mosolygó M.A.
	Ms.	Anna Mária Pásztori B.Sc.
Center for Specialization and Further Education Officer	Ms.	Regina Csató
	Ms.	Szabina Királyné Sári B.A.
	Ms.	Tímea Sólyomné Dihen B.A.
	Ms.	Erzsébet Takács-Szabó B.A.
	Ms.	Ibolya Takácsné Csatári

COORDINATING CENTER FOR INTERNATIONAL EDUCATION

Nagyerdei krt. 94., Debrecen, 4032
Telephone: +36-52-258-058 Fax: +36-52-414-013
E-mail: info@edu.unideb.hu, Web: www.edu.unideb.hu

Director	Prof.	Attila Jenei Ph.D.
Program Coordinator	Prof.	Ferenc Erdődi Ph.D, D.Sc.
BMC Coordinator	Ms.	Beáta Lontay Ph.D.

Manager Assistants	Ms.	Anna Kapitány M.Sc.
	Ms.	Andrea Tiba B.Sc.
Contract&Marketing Coordinator		Ábrahám Gergely Varga J.D.
Financial Coordinator	Ms.	Rita Kovács J.D.
Agent Coordinator		József Harmati J.D.
English Program Coordinators	Ms.	Dóra Benkő B.A. (Admissions, Visa issues, BMC)
	Ms.	Adrienn Gagna-Szakó M.Sc. (Admissions, BMC, US Loans, Wyckoff HMC Applications)
	Ms.	Anett Galvácsi M.A (Tuition fee, Financial Certificates, Refunds, USMLE Coordinator)
	Ms.	Katalin Györe M.A. (Admissions, Visa issues, BMC)
	Ms.	Krisztina Németh M.Sc. (Bulletin)
	Ms.	Enikő Sallai M.Sc. (Tuition fee, Health Insurance)
	Ms.	Bella Brigitta Szilágyi M.A. (Stipendium Hungaricum Coordinator)
IT Project Coordinator		Imre Szűcs B.Sc.

CHAPTER 5
BASIC MEDICINE COURSE

BASIC MEDICINE COURSE - INTRODUCTION TO BIOLOGY

Nagyerdei krt. 94., Debrecen, 4032
Web: www.bmc.unideb.hu

BMC Coordinator	Ms.	Beáta Lontay M.Sc., Ph.D.
Course Coordinator	Ms.	Klára Matesz M.D., Ph.D., D.Sc.
Study Advisor		András Penyige M.Sc., Ph.D. (BMC I 1st semester; BMC II)
		Norbert Szentandrássy M.D., Ph.D. (BMC I 2nd semester; BMC II)
Lecturer		János Almássy M.Sc., Ph.D.
	Ms.	Zsófia Antal M.D., Ph.D.
	Ms.	Szilvia Benkő M.Sc., Ph.D.
		András Penyige M.Sc., Ph.D.
		Norbert Szentandrássy M.D., Ph.D.
		András Birinyi M.Sc., Ph.D.
	Ms.	Zsuzsanna Birkó M.Sc., Ph.D.
		Sándor Biró M.Sc., Ph.D., D.Sc.
		Gergely Buglyó M.D., Ph.D.
	Ms.	Gabriella Czifra M.Sc., Ph.D.
	Ms.	Beatrix Dienes M.Sc., Ph.D.
		János Fodor M.Sc., Ph.D.
		Botond Gaál M.Sc., Ph.D.
	Ms.	Krisztina Holló M.Sc., Ph.D.
		Balázs Horváth M.D., Ph.D.
	Ms.	Ágnes Jenes M.D., Ph.D.
	Ms.	Judit Keserű M.Sc., Ph.D.
	Ms.	Klára Matesz M.D., Ph.D., D.Sc.
		Csaba Matta M.Sc., Ph.D.
	Ms.	Johanna Mihály M.Sc., Ph.D.
		Tamás Oláh M.Sc., Ph.D.
		Attila Oláh M.Sc., Ph.D.
	Ms.	Melinda Paholcsek M.Sc., Ph.D.
		Balázs Pál M.D.,Ph.D.

	Ms.	Éva Rácz M.Sc., Ph.D.
	Ms.	Anitta Kinga Sárvári M.Sc.
	Ms.	Magdolna Szántó M.Sc., Ph.D.
	Ms.	Krisztina Szirák M.Sc., Ph.D.
		Attila Szöllősi M.D.
		István Balázs Tóth M.Sc., Ph.D.
	Ms.	Angelika Varga M.Sc., Ph.D.
		Ervin Wolf M.Sc., Ph.D.
	Ms.	Róza Zákány M.D., Ph.D.

BASIC MEDICINE COURSE - INTRODUCTION TO BIOPHYSICS
Nagyerdei krt. 94., Debrecen, 4032
Web: www.bmc.unideb.hu

BMC Coordinator	Ms.	Beáta Lontay M.Sc., Ph.D.
Course Coordinator		János Szöllősi M.Sc., Ph.D., D.Sc., M.H.A.Sc.
Study Advisor		Attila Jenei M.Sc., Ph.D. (BMC II)
		Zoltán Varga M.Sc., Ph.D. (BMC I)
Lecturer		Zsolt Bacsó M.D., Ph.D.
		Péter Hajdu M.Sc., Ph.D.
		Attila Jenei M.Sc., Ph.D.
		Tamás Kovács M.D.
		Zoltán Krasznai M.Sc., Ph.D.
		László Mátyus M.D., Ph.D., D.Sc.
	Ms.	Enikő Nizsalóczki M.Sc.
		György Panyi M.D., Ph.D., D.Sc.
		Pál Pap M.Sc., Ph.D.
		Ferenc Papp M.Sc., Ph.D.
		G. Tibor Szántó M.Sc., Ph.D.
		János Szöllősi M.Sc., Ph.D., D.Sc., M.H.A.Sc.
	Ms.	Ágnes Tóth M.Sc., Ph.D.
		Zoltán Varga M.Sc., Ph.D.

BASIC MEDICINE COURSE - INTRODUCTION TO MEDICAL CHEMISTRY

Nagyerdei krt. 94., Debrecen, 4032
Web: www.bmc.unideb.hu

BMC Coordinator	Ms.	Beáta Lontay M.Sc., Ph.D.
Course Coordinator		László Virág M.D., Ph.D., D.Sc.
Study Advisor		Endre Kókai M.Sc., Ph.D. (BMC I)
	Ms.	Éva Bakó M.Sc., Ph.D. (BMC II)
Lecturer	Ms.	Éva Bakó M.Sc., Ph.D.
	Ms.	Edina Bakondi M.Sc., Ph.D.
		Péter Bay M.Sc., Ph.D.
		Bálint Bécsi M.Sc., Ph.D.
		Endre Kókai M.Sc., Ph.D.
	Ms.	Anita Boratkó M.Sc., Ph.D.
	Ms.	Csilla Csortos M.Sc., Ph.D.
		Tibor Docsa M.Sc., Ph.D.
		Viktor Dombrádi M.Sc., Ph.D., D.Sc.
		Ferenc Erdődi Ph.D., D.Sc.
	Ms.	Ilona Farkas M.Sc., Ph.D.
		Csaba Hegedűs M.Sc., Ph.D.
	Ms.	Judit Iván M.Sc., Ph.D.
	Ms.	Andrea Kiss M.Sc., Ph.D.
	Ms.	Katalin Kovács M.Sc., Ph.D.
	Ms.	Beáta Lontay M.Sc., Ph.D.
		Dénes Nagy M.Sc., Ph.D.
		Béla Tóth M.Sc., Ph.D.
		László Virág M.D., Ph.D., D.Sc.

CHAPTER 6
DEPARTMENTS OF THE FACULTY OF PHARMACY

FACULTY OF PHARMACY

Egyetem tér 1., Debrecen, 4032, Tel: +36-52-411-717/54033, 54013
E-mail: vecsernyes.miklos@pharm.unideb.hu

Associate Professor, Dean		Miklós Vecsernyés D.Pharm., Ph.D.
Full Professor, Vice-Dean for General and Development Affairs		Gábor Halmos D.Pharm., Ph.D.
Vice-Dean for Educational Affairs	Ms.	Ildikó Bácskay D.Pharm., Ph.D.
Invited Lecturer (Central Pharmacy)		Gyula Buccholcz D.Pharm., Ph.D.
	Ms.	Adina Fésüs D.Pharm., M.Sc.
		István Kraszits D.Pharm.
	Ms.	Orsolya Kungler-Gorácz D.Pharm.
		Csongor Szabó D.Pharm., M.Sc.
Invited Lecturer		Antal Ferenc Bálint D.V.M.
	Ms.	Zsuzsanna Bányai D.Pharm.
		Tibor Bárd D.Pharm.
		Dávid Bárd D.Pharm.
		László Elek J.D.
		József Milbik D.Pharm.
		Attila Szabó M.Sc., Ph.D.
Head of Dean's Office	Ms.	Mária Vaszily
Financial Officer	Ms.	Szilvia Lakatos

DEPARTMENT OF BIOPHARMACY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-411-717/54591
E-mail: lakatos.szilvia@pharm.unideb.hu

Professor, Head of Department		Gábor Halmos D.Pharm., Ph.D.
Assistant Lecturer		Gábor Oláh D.Pharm.
	Ms.	Zsuzsanna Szabó M.Sc., Ph.D.
Senior Lecturer	Ms.	Nikoletta Dobos M.Sc., Ph.D.
Resident		Kristóf Harda D.Pharm.
	Ms.	Éva Sipos D.Pharm.
PhD Student	Ms.	Klára Molnár-Fodor M.Sc.

Academic Advisor	Ms.	Szilvia Lakatos

DEPARTMENT OF CLINICAL PHARMACOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-600

Associate Professor, Head of Department		Miklós Bodor M.D.,Ph.D.
Full Professor		Péter Kovács M.D., DLA, Ph.D., D.Sc.
Assistant Lecturer		Sándor Somodi M.D., Ph.D.
PhD Student	Ms.	Eszter Berta M.D.

DEPARTMENT OF INDUSTRIAL PHARMACEUTICAL TECHNOLOGY

Pallagi út 13., Debrecen, 4022

Head of Department	Ms.	Magdolna Györgyné Vágó D.Pharm., Ph.D.
Invited Lecturer		Péter Dér D.Pharm.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

Egyetem tér 1., Pf. 70., Debrecen, 4032, Tel: +36-52-512-900/22896
Web: http://pharm.unideb.hu

Professor, Head of Department	Ms.	Anikó Borbás Ph.D., D.Sc.
Professor		Pál Herczegh Ph.D., D.Sc.
Assistant Professor	Ms.	Ilona Bakai-Bereczki Ph.D.
	Ms.	Magdolna Csávás Ph.D.
Assistant Lecturer		Dániel Eszenyi
	Ms.	Erika Mező Ph.D.
Research Fellow		Mihály Herczeg Ph.D.
PhD Student		Miklós Bege
		Ádám Hadházi
		Máté Kicsák
		Zsolt Szűcs
Academic Advisor	Ms.	Magdolna Csávás Ph.D.

DEPARTMENT OF PHARMACEUTICAL SURVEILLANCE AND ECONOMICS

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-411-717/54474

Associate Professor, Head of Department		Béla Tóth E. M.D., Ph.D.
Assistant Lecturer	Ms.	László Horváth D.Pharm.

DEPARTMENT OF PHARMACEUTICAL TECHNOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-411-717/54013
E-mail: vaszily.maria@pharm.unideb.hu

Associate Professor, Head of Department		Miklós Vecsernyés D.Pharm., Ph.D.
Associate Professor	Ms.	Ildikó Bácskay D.Pharm., Ph.D.
Assistant Professor		Ferenc Fenyvesi D.Pharm., Ph.D.
		Zoltán Ujhelyi D.Pharm., Ph.D.
	Ms.	Judit Váradi D.Pharm., Ph.D.
Assistant Lecturer	Ms.	Pálma Fehér D.Pharm.
Resident		Dávid Sinka D.Pharm.
		Gábor Vasvári D.Pharm.
Research Assistant	Ms.	Katalin Réti-Nagy D.Pharm.
PhD Student	Ms.	Kalantari Azin D.Pharm.
	Ms.	Eszter Róka D.Pharm.
Academic Advisor	Ms.	Pálma Fehér D.Pharm.
Head of Office	Ms.	Mária Vaszily

DEPARTMENT OF PHARMACOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-586

Professor, Head of Department		Árpád Tósaki D.Pharm., Ph.D., D.Sc.
Associate Professor		István Bak M.Sc., Ph.D.
Assistant Professor		Rudolf Gesztelyi M.D., Ph.D.
		István Lekli D.Pharm., Ph.D.
Assistant Lecturer	Ms.	Evelin Csépányi D.Pharm.
		Attila Czompa D.Pharm., Ph.D.
Resident	Ms.	Kitti Szőke D.Pharm.
Research Assistant	Ms.	András Czeglédi M.Sc.

PhD Student	Ms.	Alexandra Gyöngyösi D.Pharm.
		Péter Szabados-Fürjesi M.Sc.
	Ms.	Rita Zilinyi M.Sc.
Academic Advisor		István Lekli D.Pharm., Ph.D.

CHAPTER 7
FACULTY OF MEDICINE - DEPARTMENTS OF BASIC SCIENCES

DEPARTMENT OF ANATOMY, HISTOLOGY AND EMBRYOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-567
Web: http://www.anat.dote.hu

Associate Professor, Head of the Department		Péter Szücs M.D., Ph.D.
Full Professor, Head of Oral Anatomy Division	Ms.	Klára Matesz M.D., Ph.D., D.Sc.
Full Professor		Miklós Antal M.D., Ph.D., D.Sc.
Professor Emeritus		István Földes M.D., Ph.D., D.Sc.
		László Módis M.D., Ph.D., D.Sc.
		György Székely M.D., Ph.D., D.Sc., M.H.A.Sc.
Associate Professor		András Birinyi M.Sc., Ph.D.
		Szabolcs Felszeghy Ph.D., D.D.S.
		Zoltán Kisvárday M.Sc., Ph.D., D.Sc.
		Ervin Wolf M.Sc., Ph.D.
	Ms.	Róza Zákány M.D., Ph.D.
Assistant Professor	Ms.	Krisztina Holló M.Sc., Ph.D.
		Tamás Juhász M.Sc., Ph.D.
		Csaba Matta M.Sc., Ph.D.
		Zoltán Mészár M.Sc., Ph.D.
Postgraduate Lecturer	Ms.	Cintia Angel M.Sc.
	Ms.	Zsófia Antal M.D., Ph.D.
	Ms.	Anita Balázs M.Sc., Ph.D.
		Botond Gaál M.Sc., Ph.D.
	Ms.	Krisztina Hegedűs M.Sc.
		Zoltán Hegyi M.Sc., Ph.D.
	Ms.	Edina Karanyecz M.Sc.
	Ms.	Éva Katona M.Sc.
	Ms.	Szilvia Kecskés M.Sc., Ph.D.
	Ms.	Annamária Kenyeres M.Sc.
	Ms.	Lívia Kicska M.Sc.
	Ms.	Gréta Kis M.Sc.

	Ms.	Ildikó Papp M.Sc., Ph.D.
	Ms.	Éva Rácz M.Sc., Ph.D.
	Ms.	Zsanett Sólyom M.Sc.
	Ms.	Csilla Somogyi M.Sc.
	Ms.	Ildikó Wéber M.Sc., Ph.D.
Junior Scientific Officer	Ms.	Nóra Dobrosi M.Sc.
		László Ducza M.Sc.
		Zsolt Kocsis M.D.
		Roland Takács M.Sc.
Invited Lecturer		Gary Kish M.D.
Course Director		Tamás Juhász M.Sc., Ph.D. (Macroscopic Anatomy)
		Zoltán Kisvárday M.Sc., Ph.D., D.Sc. (Neurobiology)
		Ervin Wolf M.Sc., Ph.D. (Histology and Embryology)
PhD Student	Ms.	Klaudia Dócs M.Sc.
	Ms.	Javdani Fariba M.D.
	Ms.	Andrea Gajtkó M.Sc.
		Tibor Hajdú M.D.
	Ms.	Andrea Hunyadi M.Sc.
		Mohit Srivastava M.Sc.
	Ms.	Rita Varga M.Sc.
Academic Advisor for 1st year medical and dental students	Ms.	Gréta Kis M.Sc.
Academic Advisor for 2nd year medical and dental students	Ms.	Mónika Szakadát M.Sc.

DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-416-432
E-mail: tokes@med.unideb.hu, Web: http://bmbi.med.unideb.hu

Full Professor, Head of Department		József Tőzsér M.Sc., Ph.D., D.Sc.
Head of Dental Biochemistry Division	Ms.	Zsuzsa Szondy M.D., Ph.D., D.Sc.
Full Professor		Endre Barta M.Sc., Ph.D.
		László Fésüs M.D., Ph.D., D.Sc., M.H.A.Sc.
	Ms.	Mónika Fuxreiter M.Sc., Ph.D., D.Sc.

		László Nagy M.D., Ph.D., M.H.A.Sc.
Associate Professor		Zoltán Balajthy M.Sc., Ph.D.
	Ms.	Réka Révészné Tóth M.Sc., Ph.D.
		István Szatmári M.Sc., Ph.D.
Assistant Professor		Bálint Bálint L. M.D., Ph.D.
	Ms.	Éva Csősz M.Sc., Ph.D.
		Róbert Király M.Sc., Ph.D.
		Zsolt Sarang M.Sc., Ph.D.
	Ms.	Beáta Scholtz M.Sc., Ph.D.
		Lóránt Székvölgyi M.Sc., Ph.D.
		Lajos Széles M.Sc., Ph.D.
	Ms.	Szilvia Tőkés M.Sc., Ph.D.
Senior Research Fellow		András Mádi M.Sc., Ph.D.
Research Fellow	Ms.	Beáta Bartáné Tóth M.Sc., Ph.D.
		Máté Demény M.D., Ph.D.
		Márton Miskei M.Sc., Ph.D.
		Szilárd Póliska M.Sc., Ph.D.
	Ms.	Mónika Szentandrássyné Gönczi M.Sc., Ph.D.
		Tamás Varga M.Sc., Ph.D.
Junior Research Fellow	Ms.	Rita Hegymeginé Elek M.Sc.
	Ms.	Krisztina Joóné Matúz M.Sc., Ph.D.
	Ms.	Beáta Kiss M.Sc.
		Endre Károly Kristóf M.D.
	Ms.	Krisztina Lenténé Köröskényi M.Sc., Ph.D.
		Mohamed Faisal Mahdi M.D.
	Ms.	Ágnes Mosolygó-Lukács M.Sc.
		János Mótyán M.Sc., Ph.D.
		Gergely Nagy M.Sc.
		Attila Pap M.Sc.
	Ms.	Éva Péntek-Garabuczi M.Sc., Ph.D.
Biologist		Tamás Kerekes M.Sc.
	Ms.	Erzsébet Mátyás M.Sc.
	Ms.	Éva Nagy M.Sc.
	Ms.	Tímea Silye-Cseh M.Sc.

PhD Student		Viktor Ambrus M.Sc.
	Ms.	Dóra Bojcsuk M.Sc.
		Pál Botó M.Sc.
	Ms.	Zsófia Budai M.Sc.
	Ms.	Mária Csumita M.Sc.
		Tamás Csuth M.Sc.
		Erik Czipa M.Sc.
	Ms.	Katalin Dánielné Sándor M.Sc.
	Ms.	Eszter Deák M.D., M.Sc.
		Norbert Duró M.Sc.
	Ms.	Ergulen Elvan M.Sc.
	Ms.	Edina Erdős M.Sc.
	Ms.	Lívia Gazda M.Sc.
	Ms.	Mária Golda M.Sc.
		László Halász M.Sc.
		Szabolcs Hetey M.Sc.
		Attila Horváth M.Sc.
		József Horváth M.Sc.
	Ms.	Monroy Ixchelt Cuaranta M.Sc.
	Ms.	Bernadett Jakob M.Sc.
		Károly Jambrovics M.Sc.
		Gergely Joós M.D.
		Gergő Kalló M.Sc.
		Norbert Kassay M.Sc.
		Thangarajan Kiruphagaran M.Sc.
	Ms.	Ágnes Klusóczki M.Sc.
	Ms.	Lilla Ozgyin M.Sc.
		Andreas Patsalos M.Sc.
	Ms.	Rashmi Rashmi M.Sc.
		Tibor Sághy M.Sc.
	Ms.	Mária Szatmári Tóth M.Sc.
	Ms.	Zsófia Szojka M.Sc.
	Ms.	Erika Takács M.Sc.
Academic Advisor	Ms.	Szilvia Tőkés M.Sc., Ph.D. (E-mail: tokessz@dote.hu, Ext.:64439)

DEPARTMENT OF BIOPHYSICS AND CELL BIOLOGY

Egyetem tér 1., Debrecen, 4032

Full Professor, Head of Department		János Szöllősi M.Sc., Ph.D., D.Sc., M.H.A.Sc.
Full Professor		Attila Jenei M.Sc., Ph.D.
		György Vereb M.D., Ph.D., D.Sc.
Professor Emeritus		Sándor Damjanovich M.D., Ph.D., D.Sc., M.H.A.Sc.
Associate Professor		Zsolt Bacsó M.D., Ph.D.
Assistant Professor		Zsolt Fazekas M.Sc., Ph.D.
		Péter Hajdu M.Sc., Ph.D.
Assistant Lecturer	Ms.	Ágnes Tóth M.Sc., Ph.D.
Research Fellow	Ms.	Beáta Mészáros M.Sc., Ph.D.
	Ms.	Ágnes Nagyné Dr. Szabó M.Sc., Ph.D.
		Pál Pap M.Sc., Ph.D.
	Ms.	Tímea Váradi M.Sc., Ph.D.
	Ms.	Barbara Zsebik M.Sc., Ph.D.
Junior Research Fellow		Tamás Kovács M.D.
		László Ujlaky-Nagy M.D.
	Ms.	Julianna Volkó M.Sc.
Biologist		Gábor Szalóki M.Sc.
Bioimaging expert		Gábor Mocsár M.Sc.
PhD Student		András Balajthy M.D.
		Csaba Bankó M.Sc.
		István Csomós M.Sc.
	Ms.	Ágota Csóti M.Sc.
	Ms.	Erfaneh Firouzi Niaki D.Pharm.
	Ms.	Tímea Hajdu M.Sc.
		Péter Nánási M.D.
		Zoltán Dénes Pethő M.D.
		István Rebenku M.Sc.
	Ms.	Tímea Szendi-Szatmári M.Sc.
		Szabolcs Tarapcsák M.Sc.
		Gábor Tóth M.D.

	Ms.	Orsolya Vörös M.Sc.
	Ms.	Florina Zákány M.D.
Visiting Lecturer		László Bene M.Sc., Ph.D.
		Zoltán Krasznai M.Sc., Ph.D.
Academic Advisor		Zsolt Fazekas M.Sc., Ph.D.

Division of Biomathematics

Egyetem tér 1., Debrecen, 4032, Tel: +36 52 258 603
E-mail: biophysedu@med.unideb.hu, Web: http://biophys.med.unideb.hu

Full Professor, Head of Division		László Mátyus M.D., Ph.D., D.Sc.
Full Professor		Péter Nagy M.D., Ph.D., D.Sc.
Senior Research Fellow	Ms.	Andrea Dóczy-Bodnár M.Sc., Ph.D.
Teaching assistant	Ms.	Enikő Nizsalóczki M.Sc.

Division of Biophysics

Egyetem tér 1., Debrecen, 4032, Tel: +36 52 258 603
E-mail: biophysedu@med.unideb.hu, Web: http://biophys.med.unideb.hu

Full Professor, Head of Division		György Panyi M.D., Ph.D., D.Sc.
Associate Professor		Zoltán Varga M.Sc., Ph.D.
Assistant Lecturer		Ferenc Papp M.Sc., Ph.D.
		G. Tibor Szántó M.Sc., Ph.D.
		Árpád Szöőr M.D., Ph.D.
Senior Research Fellow		György Vámosi M.Sc., Ph.D.

Division of Cell Biology

Egyetem tér 1., Debrecen, 4032, Tel: +36 52 258 603
E-mail: biophysedu@med.unideb.hu, Web: http://biophys.med.unideb.hu

Full Professor, Head of Division		Gábor Szabó M.D., Ph.D., D.Sc.
Assistant Professor	Ms.	Katalin Goda M.Sc., Ph.D.
Assistant Lecturer	Ms.	Éva Hegedüs M.Sc., Ph.D.
Biologist		László Imre M.Sc.

DEPARTMENT OF FORENSIC MEDICINE

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-865
E-mail: herczeg.l.t@gmail.com

Associate Professor, Head of Department		László Herczeg M.D., Ph.D.
Assistant Lecturer	Ms.	Beáta Ágnes Borsay M.D.
		Péter Gergely M.D.
		Kálmán Rácz M.D.
		Csaba Turzó M.D.
Clinical Assistant		Mihály Fodor M.D.
Resident	Ms.	Barbara Dóra Halasi M.D.
Toxicologist		János Posta Ph.D.
Psychiatrist	Ms.	Erika Tar M.D.

DEPARTMENT OF HUMAN GENETICS

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-416-531
E-mail: nagy.balint@med.unideb.hu, Web: http://www.genetics.dote.hu

Associate Professor, Head of Department		Bálint Nagy M.Sc., Ph.D. habil., D.Sc.
Full Professor		Sándor Biró M.Sc., Ph.D., D.Sc.
		László Takács M.D., Ph.D., D.Sc., M.H.A.Sc.
Professor Emeritus		György Barabás M.Sc., Ph.D., D.Sc.
Associate Professor		András Penyige M.Sc., Ph.D.
Assistant Professor	Ms.	Zsuzsanna Birkó M.Sc., Ph.D.
	Ms.	Judit Keserű M.Sc., Ph.D.
Assistant Lecturer		Gergely Buglyó M.D., Ph.D.
	Ms.	Melinda Paholcsek M.Sc., Ph.D.
	Ms.	Melinda Szilágyi-Bónizs M.Sc., Ph.D.
	Ms.	Krisztina Szirák M.Sc., Ph.D.
Molecular Biologist	Ms.	Beáta Soltész M.Sc.
Invited Lecturer		Zsigmond Fehér M.D., Ph.D.
		József Schlammadinger M.D., Ph.D.
		György Vargha M.D., Ph.D.
		Sándor Vitális M.D., Ph.D.
PhD Student		Gábor Fidler M.Sc.
Academic Advisor		András Penyige M.Sc., Ph.D. (BMC, Biology, Human Genetics)

Academic Advisor for 1st year medical and dental students		Sándor Biró Ph.D., D.Sc.

DEPARTMENT OF IMMUNOLOGY

Egyetem tér 1., Debrecen, 4032, Tel: +36-52-417-159
Web: www.immunology.unideb.hu

Full Professor, Head of Department		Tamás Bíró M.D., Ph.D., D.Sc.
Full Professor	Ms.	Éva Rajnavölgyi M.Sc., Ph.D., D.Sc.
Associate Professor		Attila Bácsi M.Sc., Ph.D.
		Árpád Lányi M.Sc., Ph.D.
Assistant Lecturer	Ms.	Zsófia Agod M.Sc.
	Ms.	Tünde Fekete M.Sc., Ph.D.
		Attila Szabó M.Sc., Ph.D.
	Ms.	Aliz Varga M.Sc., Ph.D.
Research Fellow		Péter Gogolák M.Sc., Ph.D.
		Gábor Koncz M.Sc., Ph.D.
	Ms.	Kitti Pázmándi M.Sc., Ph.D.
Research Assistant	Ms.	Adrienn Gyöngyösi M.Sc.
PhD Student		Pál Krisztián Bene M.Sc.
	Ms.	Eszter Boldizsár
	Ms.	Noémi Miltner M.Sc.
		Máté István Sütő M.Sc.
	Ms.	Márta Tóth M.Sc.
	Ms.	Anett Türk-Mázló M.Sc.
Academic Advisor		Gábor Koncz M.Sc., Ph.D.

DEPARTMENT OF LABORATORY MEDICINE

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-340-006
E-mail: kbmpi@kbmpi.hu, Web: www.kbmpi.hu

Full Professor, Head of Department		János Kappelmayer M.D., Ph.D., D.Sc.
Associate Professor, Head of Division of Clinical Genetics		István Balogh M.Sc., Ph.D.
Associate Professor		Péter Antal-Szalmás M.D., Ph.D.
	Ms.	Zsuzsa Hevessy M.D., Ph.D.
Assistant Professor	Ms.	Adrienne Kerényi M.D., Ph.D.

		Béla Nagy Jr. M.D., Ph.D.
		Harjit Pal Bhattoa M.D., Ph.D.
	Ms.	Anikó Ujfalusi M.D., Ph.D.
Assistant Lecturer		Sándor Baráth M.Sc., Ph.D.
		Gergely Ivády M.D.
	Ms.	Katalin Koczok M.D.
	Ms.	Zsuzsanna Molnár M.D., Ph.D.
		Gábor Nagy M.D.
	Ms.	Eszter Szánthó M.D.
Senior Research Fellow		István Csípő M.Sc., Ph.D.
	Ms.	Edit Gyimesi M.Sc., Ph.D.
	Ms.	Anna Oláh M.Sc., Ph.D.
Postdoctoral Fellow		Attila Mokánszki M.Sc., Ph.D.
Research Fellow	Ms.	Beáta Tóth M.Sc., Ph.D.
	Ms.	Erika Zilahi M.Sc., Ph.D.
Junior Research Fellow	Ms.	Beáta Bessenyei M.Sc., Ph.D.
Lecturer	Ms.	Judit Budainé Tóth M.D.
	Ms.	Sarolta Demeter M.D.
	Ms.	Bettina Kárai M.D.
		Zoltán Mezei M.D.
Resident	Ms.	Renáta Hudák M.D.
	Ms.	Zsuzsanna. Nagy M.D.
Invited Lecturer	Ms.	Éva Ajzner M.D., Dr. habil., Ph.D.
		Gábor Papp M.D., Ph.D.
PhD Student		Zsolt Fejes M.Sc.
	Ms.	Orsolya Nagy- M.Sc.
		Dávid Tornai M.D.
Academic Advisor	Ms.	Adrienne Kerényi M.D., Ph.D.

Division of Clinical Genetics

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36 52 340 006
E-mail: bessenyei.beata@med.unideb.hu, Web: www.kbmpi.hu, www.klinikaigenetika.hu

Associate Professor, Head of Division		István Balogh M.Sc., Ph.D.
Academic Advisor	Ms.	Beáta Bessenyei M.Sc., Ph.D.

Division of Clinical Laboratory Science

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-431-956
E-mail: ekatona@med.unideb.hu, Web: crc.med.unideb.hu

Associate Professor, Head of Division	Ms.	Zsuzsanna Bereczky M.D., Dr. habil., Ph.D.
Professor Emeritus		László Muszbek M.D., Ph.D., D.Sc., M.H.A.Sc.
Associate Professor	Ms.	Éva Katona M.Sc.
Assistant Professor	Ms.	Zsuzsa Bagoly M.D., Ph.D.
Assistant Lecturer	Ms.	Krisztina Pénzes-Daku M.Sc., Ph.D.
Senior Research Fellow		István Komáromi M.Sc., Ph.D.
Junior Research Fellow		Attila Fekete M.Sc.
	Ms.	Réka Gindele M.Sc.
External Tutor	Ms.	Éva Ajzner M.D., Dr. habil., Ph.D.
	Ms.	Zsuzsanna Orosz M.D., Ph.D.
		Béla Tóth M.Sc., Ph.D.
PhD Student	Ms.	Ágnes Bádogos M.D.
		Gábor Balogh M.Sc.
	Ms.	Barbara Baráth M.Sc.
	Ms.	Réka Bogáti M.Sc.
	Ms.	Boglárka Hurják M.Sc.
	Ms.	Mária Kun M.Sc.
	Ms.	Tünde Miklós M.D.
	Ms.	Laura Somodi M.Sc.
	Ms.	Marianna Speker M.Sc.
	Ms.	Noémi Klára Tóth M.D.
Academic Advisor	Ms.	Éva Katona M.Sc.

DEPARTMENT OF MEDICAL CHEMISTRY

Egyetem tér 1., Debrecen, 4010, Tel: +39-52-412-345
E-mail: medchem@unideb.hu, Web: medchem.unideb.hu

Full Professor, Head of Department		László Virág M.D., Ph.D., D.Sc.
Full Professor		Viktor Dombrádi M.Sc., Ph.D., D.Sc.
		Ferenc Erdődi M.Sc., Ph.D., D.Sc.
		Pál Gergely M.Sc., Ph.D., D.Sc., M.H.A.Sc.
Associate Professor		Péter Bay M.Sc., Ph.D.
	Ms.	Csilla Csortos M.Sc., Ph.D.
	Ms.	Ilona Farkas M.Sc., Ph.D.
Assistant Professor	Ms.	Éva Bakó M.Sc., Ph.D.
	Ms.	Edina Bakondi M.Sc., Ph.D.
		Tibor Docsa M.Sc., Ph.D.
		Csaba Hegedűs M.Sc., Ph.D.
	Ms.	Andrea Kiss M.Sc., Ph.D.
		Endre Kókai M.Sc., Ph.D.
	Ms.	Beáta Lontay M.Sc., Ph.D.
	Ms.	Krisztina Tar M.Sc., Ph.D.
Assistant Lecturer		Bálint Bécsi M.Sc., Ph.D.
	Ms.	Karolina Cseri M.Sc.
	Ms.	Judit Iván M.Sc., Ph.D.
Research Fellow	Ms.	Anita Boratkó M.Sc., Ph.D.
	Ms.	Edit Kapitányné Mikó M.Sc., Ph.D.
	Ms.	Katalin Kovács M.Sc., Ph.D.
		Dénes Nagy M.Sc., Ph.D.
		András Vida M.Sc., Ph.D.
Junior Research Fellow	Ms.	Petra Lakatos M.Sc.
	Ms.	Adrienn Sipos M.Sc.
Invited Lecturer		Béla Tóth M.Sc., Ph.D.
PhD Student		Tamás Fodor M.Sc.
		Dániel Horváth M.Sc.
		Tamás Kéki M.Sc.
		Zoltán Kónya M.Sc.
	Ms.	Tünde Kovács M.Sc.

	Ms.	Judit Márton M.Sc.
	Ms.	Lilla Nikoletta Nagy M.Sc.
	Ms.	Margit Péter M.Sc.
	Ms.	Katalin Petrényi M.Sc.
		Zsolt Regdon M.Sc.
	Ms.	Ildikó Szabó M.Sc.
		István Tamás M.Sc.
	Ms.	Emese Tóth M.Sc.
	Ms.	Zsuzsanna Valkó M.Sc.
Academic Advisor	Ms.	Éva Bakó M.Sc., Ph.D.

DEPARTMENT OF MEDICAL MICROBIOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-425
E-mail: mikro@dote.hu, Web: go.unideb.hu

Associate Professor, Head of Department		József Kónya M.D., Ph.D.
Professor Emeritus		Lajos Gergely M.D., Ph.D., D.Sc.
Associate Professor		László Majoros M.D., Ph.D.
	Ms.	Judit Szabó M.D., Ph.D.
		György Veress M.Sc., Ph.D.
Assistant Professor	Ms.	Eszter Csoma M.Sc., Ph.D.
		Gábor Kardos M.D., Ph.D.
	Ms.	Krisztina Szarka M.Sc., Ph.D.
Assistant Lecturer	Ms.	Zsuzsanna Dombrádi M.Sc., Ph.D.
	Ms.	Eszter Gyöngyösi M.Sc., Ph.D.
		Renátó Kovács M.Sc., Ph.D.
	Ms.	Brigitta László M.Sc., Ph.D.
Research Fellow	Ms.	Anita Szalmás M.Sc., Ph.D.
Biologist	Ms.	Cecilia Miszti M.Sc.
		Levente Szakács M.Sc.
Resident	Ms.	Evelin Bukta M.D.
Specialist	Ms.	Anita Kozák M.D.
Academic Advisor of Faculty of Medicine		György Veress M.Sc., Ph.D.
Academic Advisor of Faculty of Dentistry		György Veress M.Sc., Ph.D.
PhD Student	Ms.	Alíz Bozó M.Sc.
	Ms.	Dorottya Franyó M.Sc.

Academic Advisor of Faculty of Pharmacy		László Majoros M.D., Ph.D.

DEPARTMENT OF PATHOLOGY
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-245
Web: pathol.med.unideb.hu

Full Professor, Head of Department		Gábor Méhes M.D., D.Sc.
Full Professor, Head of Division of Oral Pathology		Balázs Dezső M.D., D.Sc.
Full Professor		Péter Molnár M.D., D.Sc.
Professor Emeritus		Zoltán Nemes M.D., D.Sc.
Associate Professor, Head of Division of Neuropathology		Tibor Hortobágyi M.D., Ph.D.
Assistant Lecturer		Lukács Baráth M.D.
		László Bidiga M.D.
		Tamás Csonka M.D.
		Csaba Molnár M.D.
		Sándor Csaba Szász M.D.
		László Tóth M.D., Ph.D.
Resident	Ms.	Vanda Aranyi M.D.
	Ms.	Anna Arday M.D.
	Ms.	Judit Bedekovics M.D., Ph.D.
		Zoltán Hendrik M.D.
		Gábor Irsai M.D.
	Ms.	Sarolta Molnár M.D.
Academic Advisor		Csaba Molnár M.D.

DEPARTMENT OF PHARMACOLOGY AND PHARMACOTHERAPY
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-009
Web: http://pharmacology.med.unideb.hu

Full Professor, Head of Department		Zoltán Szilvássy M.D., Ph.D., D.Sc.
Professor Emeritus	Ms.	Judith Gergely D.Pharm., Ph.D., D.Sc.
Administration officer	Ms.	Oxána Kiszil J.D.
	Ms.	Andrea Szalai B.Sc., M.Sc.
Associate Professor	Ms.	Ilona Benkő M.D., Ph.D.
		Béla Juhász D.Pharm., Dr. habil., Ph.D.

		Róbert Pórszász M.D., Dr. habil., MBA, Ph.D.
		József Szentmiklósi M.D., Ph.D.
Assistant Professor		Attila Megyeri M.D., Ph.D.
Assistant Lecturer	Ms.	Ágnes Cseppentő M.D.
		Balázs Varga D.Pharm., Ph.D.
Senior Research Fellow		József Németh M.Sc., Ph.D.
Research Fellow	Ms.	Zsuzsanna Gál M.Sc., Ph.D.
	Ms.	Rita Kiss M.D., Ph.D.
Nutricionist	Ms.	Katalin Szabó M.Sc.
Chemist		Lajos Veress M.Sc.
Molecular Biologist	Ms.	Diána Kovács M.Sc., Ph.D.
PhD Student	Ms.	Mariann Bombicz D.Pharm.
	Ms.	Beáta Lelesz M.Sc.
		Dániel Priksz D.Pharm.
Junior Lecturer	Ms.	Mariann Bombicz D.Pharm.
	Ms.	Andrea Kurucz M.D.
Academic Advisor		Róbert Pórszász M.D., Dr. habil., MBA, Ph.D.

DEPARTMENT OF PHYSIOLOGY

Nagyerdei krt. 98., Debrecen, 4012, Tel: +36-52-255-575
Web: http://phys.dote.hu

Full Professor, Head of Department		László Csernoch M.Sc., Ph.D., D.Sc.
Full Professor, Head of Sport Physiology Division		János Magyar M.D., Ph.D., D.Sc.
Full Professor, Head of Dental Physiology and Pharmacology Division		Péter Nánási M.D., Ph.D., D.Sc.
Full Professor		László Csernoch M.Sc., Ph.D., D.Sc.
		János Magyar M.D., Ph.D., D.Sc.
		Péter Nánási M.D., Ph.D., D.Sc.
Professor Emeritus		László Kovács M.D., Ph.D., D.Sc., M.H.A.Sc.
Associate Professor		Tamás Bányász M.D., Ph.D.
Assistant Professor		János Almássy M.Sc., Ph.D.
	Ms.	Szilvia Benkő M.Sc., Ph.D.

		Balázs Horváth M.D., Ph.D.
		Balázs Pál M.D., Ph.D.
		Norbert Szentandrássy M.D., Ph.D.
		István Balázs Tóth M.Sc., Ph.D.
Assistant Lecturer	Ms.	Ágnes Jenes M.D., Ph.D.
		Attila Szöllősi M.D.
Postgraduate Lecturer		Attila Oláh M.D.
Senior Research Fellow		Péter Szentesi M.Sc., Ph.D.
Postdoctoral Fellow	Ms.	Johanna Mihály M.Sc., Ph.D.
	Ms.	Magdolna Szántó M.Sc., Ph.D.
Research Fellow	Ms.	Gabriella Czifra M.Sc., Ph.D.
	Ms.	Beatrix Dienes M.Sc., Ph.D.
	Ms.	Mónika Sztretye M.Sc., Ph.D.
Junior Research Fellow	Ms.	Lídia Ambrus M.Sc.
	Ms.	Adrienn Kovács M.Sc.
		Tamás Oláh M.Sc., Ph.D.
	Ms.	Anitta Kinga Sárvári M.Sc.
OTKA Postdoctoral Fellow		János Fodor M.Sc., Ph.D.
PhD Student	Ms.	Ágnes Angyal M.Sc.
		Norbert Balogh M.Sc.
	Ms.	Csilla Bordás M.Sc.
		Tamás Czirják M.Sc.
		Balázs Kelemen M.Sc.
	Ms.	Éva Kókai M.Sc.
		Gergő Kovács M.Sc.
		Arnold Markovics M.Sc.
		Imre Lőrinc Szabó M.D.
		Roland Veress M.Sc.
		János Vincze M.D.
Research Advisor		István Jóna M.Sc., Ph.D., D.Sc.

CHAPTER 8
FACULTY OF MEDICINE - CLINICAL DEPARTMENTS

DEPARTMENT OF ANESTHESIOLOGY AND INTENSIVE CARE

Nagyerdei krt. 98, Debrecen, 4032, Tel: +36-52-255-347
Web: www.aitt.deoec.hu

Full Professor, Head of Department		Béla Fülesdi M.D., Ph.D., D.Sc.
Associate Professor	Ms.	Judit Hallay M.D., Ph.D.
	Ms.	Csilla Molnár M.D., Ph.D.
Assistant Professor	Ms.	Katalin Herman M.D.
		György Koszta M.D., Ph.D.
	Ms.	Gabriella Szűcs M.D., Ph.D.
Assistant Lecturer		László Asztalos M.D.
	Ms.	Krisztina Béczy M.D.
	Ms.	Gyöngyi Békési M.D.
	Ms.	Marianna Berhés M.D.
		Ferenc Bodnár M.D.
	Ms.	Emese Csoba M.D.
		Imre Czifra M.D.
	Ms.	Marina Czurkó M.D.
	Ms.	Edit Éberhardt M.D.
	Ms.	Irén Erdei M.D.
		Ákos Fábián M.D., Ph.D.
	Ms.	Anita Fagyas M.D.
	Ms.	Ágnes Fekete M.D.
	Ms.	Annamária Filep M.D.
	Ms.	Andrea Fodor M.D.
	Ms.	Judit Gál M.D.
		Zoltán Gyöngyösi M.D.
	Ms.	Judit Gyulaházi M.D.
	Ms.	Marianna Juhász M.D.
	Ms.	Ilona Kobzos M.D.
		István László M.D.
		István Máté M.D.
	Ms.	Boglárka Megyeri M.D., Ph.D.

	Ms.	Eszter Mihály M.D.
		Dániel Nagy M.D.
	Ms.	Erzsébet Németh M.D.
	Ms.	Lívia Orosz M.D.
	Ms.	Tünde Palatka M.D.
		Balázs Pálóczi M.D.
		Csaba Papp M.D., M.Sc.
	Ms.	Erika Pető M.D.
	Ms.	Adrienn Pongrácz M.D., Ph.D.
		Péter Sárkány M.D.
	Ms.	Éva Simon M.D.
		Gábor Sira M.D.
		Péter Síró M.D., Ph.D.
		Tamás Sotkovszki M.D.
	Ms.	Zsuzsanna Spisák M.D.
		Zoltán Szabó-Maák M.D.
	Ms.	Katalin Szamos M.D.
	Ms.	Erzsébet Szászi M.D.
	Ms.	Katalin Szatmári M.D.
		Szilárd Szatmári M.D., Ph.D.
	Ms.	Ildikó Szűcs M.D.
		Gergely Takács M.D.
		Béla Tankó M.D.
	Ms.	Adrienn Timkó M.D.
	Ms.	Magdolna Váradi M.D.
	Ms.	Györgyi Vass M.D.
	Ms.	Andrea Vencel M.D.
	Ms.	Eszter Vitális M.D.
		András Zudor M.D.
Senior Lecturer		Zsolt Oláh M.D., Ph.D.
		Tamás Végh M.D., Ph.D.
Clinical Assistant	Ms.	Edit Cserép M.D.
	Ms.	Vera Csernoch M.D.
	Ms.	Dóra Cservenyák M.D.
	Ms.	Nóra Czakó M.D.

	Ms.	Eszter Farkas M.D.
	Ms.	Babett Fodor M.D.
	Ms.	Anna Illés M.D.
	Ms.	Zsuzsa Jakab M.D.
	Ms.	Enikő Jánvári M.D.
	Ms.	Lenke Jenei Kluch M.D.
	Ms.	Ágota Kazup M.D.
	Ms.	Zsuzsanna Kovács M.D.
		György Nagy M.D.
	Ms.	Réka Nemes M.D.
	Ms.	Enikő Papp M.D.
		Béla Takács M.D.
		Dávid Richárd Varga M.D.
	Ms.	Eszter Varga M.D.
Resident	Ms.	Javdani Fariba M.D.
	Ms.	Orsolya Farkas M.D.
		András Gajdos M.D.
		Endre Hajdu M.D.
		László Kozub M.D.
		Lóránd Csaba Papp M.D.
		Viktor Tóth M.D.
Academic Advisor		Tamás Sotkovszki M.D.

DEPARTMENT OF CARDIOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-928

Chairman		István Édes M.D., Ph.D., D.Sc.

Division of Cardiac Surgery

Móricz Zs. krt. 22., Debrecen, 4032, Tel: +36-52-255-306

Associate Professor, Head of Division		Tamás Szerafin M.D., Ph.D.
Professor Emeritus		Árpád Péterffy M.D., D.Sc.
Assistant Lecturer		Tamás Debreceni M.D.
	Ms.	Andrea Molnár M.D., Ph.D.
Chief Physician		Ambrus Horváth M.D.

Clinical Assistant		Tamás Maros M.D.
		Lehel Palotás M.D.
		József Simon M.D.
		István Szentkirályi M.D.
Candidate Clinical Assistant		Péter Csizmadia M.D.
		András Durkó M.D.
Resident		Ákos Attila Berczi M.D.

Division of Cardiology

Móricz Zs. krt. 22., Debrecen, 4032, Tel: +36-52-255-928
E-mail: edes@dote.hu, Web: http://en.debkard.hu

Full Professor, Head of Department		István Édes M.D., Ph.D., D.Sc.
Full Professor		Zoltán Csanádi M.D., Ph.D.
Associate Professor		Zsolt Kőszegi M.D., Ph.D.
Assistant Professor	Ms.	Judit Barta M.D., Ph.D.
	Ms.	Annamária Bódi M.D., Ph.D.
		Attila Borbély Ph.D.
		Marcel Clemens M.D., Ph.D.
	Ms.	Andrea Daragó M.D.
		Tibor Fülöp M.D., Ph.D.
		László Fülöp M.D., Ph.D.
		Szabolcs Gergely M.D.
		Attila Kertész M.D., Ph.D.
		Rudolf Kolozsvári M.D., Ph.D.
		Tibor Szűk M.D., Ph.D.
		Gusztáv Vajda M.D.
Assistant Lecturer		Dániel Czuriga M.D., Ph.D.
	Ms.	Nóra Erdei M.D., Ph.D.
	Ms.	Zita Hertelendi M.D., Ph.D.
	Ms.	Nóra Homoródi M.D.
		Csaba Jenei M.D.
	Ms.	Erzsébet Lizanecz M.D., Ph.D.
		Sándor Sipka M.D., Ph.D.
Cardiologist		László Balogh M.D.
	Ms.	Orsolya Bene M.D.

		Ferenc Győry M.D., Ph.D.
		Csaba Kun M.D.
		Andrij Leny M.D.
		László Nagy M.D.
	Ms.	Andrea Péter M.D.
	Ms.	Ildikó Rácz M.D.
	Ms.	Ágnes Orsolya Rácz M.D.
		Gábor Sándorfi M.D.
		Gábor. Szabó M.D.
		Miklós Szokol M.D.
Resident		Ferenc Abonyi
	Ms.	Ágnes Balogh M.D., Ph.D.
	Ms.	Alexandra Kiss M.D., Ph.D.
		Gábor Kolodzey M.D.
		Bertalan Kracskó M.D.
	Ms.	Krisztina Medvés-Váczi M.D.
	Ms.	Edina Nagy-Baló M.D., Ph.D.
		Gergő Szilágyi M.D.
Educational Advisor	Ms.	Judit Barta M.D., Ph.D.

Division of Clinical Physiology

Móricz Zs. krt. 22., Debrecen, 4032, Tel: +36-52-255-978
E-mail: klinfiz@med.unideb.hu, Web: http://en.klinfiz.debkard.hu/

Full Professor, Head of Division		Zoltán Papp M.D., Ph.D., D.Sc.
Full Professor		Attila Tóth M.Sc., Ph.D., D.Sc.
Assistant Lecturer	Ms.	Viktória Csató M.Sc., Ph.D.
		Miklós Fagyas M.D., Ph.D.
Laboratory Assistant	Ms.	Ivetta Mányiné Siket
Secretariat	Ms.	Krisztina Kass
Laboratory Analyst	Ms.	Enikő T. Pásztor B.Sc.
Research Assistant		Gerardo Alvarado Contreras M.D.
		Árpád Kovács M.D.
PhD Student	Ms.	Beáta Bódi M.Sc.
		Tamás Csípő M.D.
	Ms.	Alexandra Csongrádi M.Sc.

		Gábor Áron Fülöp M.D.
	Ms.	Mária Lódi M.Sc.
Academic Advisor		Miklós Fagyas M.D., Ph.D. (email: fagyasmiklos@med.unideb.hu)

DEPARTMENT OF CLINICAL ONCOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-585
Web: http://oncology.deoec.hu

Head of Department	Zsolt Horváth M.D., Ph.D.
Senior Research Scientist	Iván Uray M.D., Ph.D.

Division of Clinical Oncology

Nagyerdei krt. 98, Debrecen, 4032, Tel: +36-52-255-840

Head of Division	Ms.	Judit Kocsis M.D., Ph.D.
Assistant Professor	Ms.	Csilla András M.D., Ph.D.
	Ms.	Éva Szekanecz M.D., Ph.D.
Clinical Specialist	Ms.	Ingrid Balogh M.D.
		Balázs Juhász M.D.
	Ms.	Mónika Mailáth M.D.
	Ms.	Judit Tóth M.D.
Resident	Ms.	Csilla Ambrus M.D.
	Ms.	Anita Árokszállási M.D.
	Ms.	Edit Béres M.D.
	Ms.	Enikő Varga M.D.
Academic Advisor	Ms.	Csilla András M.D., Ph.D.

Division of Radiotherapy

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-585

Assistant Professor	Ms.	Andrea Furka M.D., Ph.D.
Clinical Specialist	Ms.	Mária Besenyői M.D.
		Ádám Dér M.D.
		Levente Jánváry M.D.
	Ms.	Erzsébet Kollák M.D.
	Ms.	Adrienn Opauszki M.D.

	Ms. Erika Szántó M.D.
	Ms. Hilda Urbancsek M.D.
Resident	Ms. Emese Csiki M.D.
Physicist	István Balogh
	Erik Dobos Ph.D.
	Gergely Hócza
	Attila Kovács
	Mihály Simon
Academic Advisor	Ms. Mária Besenyői M.D.

DEPARTMENT OF DERMATOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-204

E-mail: dermatologia@med.unideb.hu, Web: www.dermatologia.med.unideb.hu

Full Professor, Head of Department	Ms. Éva Remenyik M.D., Ph.D., D.Sc.
Full Professor, Head of Division of Dermatological Allergology	Ms. Andrea Szegedi M.D., Ph.D., D.Sc.
Full Professor, Head of Division of Human Surgery and Op. Techniques	István Juhász M.D., Ph.D., C.Sc.
Professor Emerita	Ms. Irén Horkay M.D., Ph.D., D.Sc.
Professor Emeritus	János Hunyadi M.D., Ph.D., D.Sc.
Associate Professor	Ms. Éva Szabó M.D., Ph.D.
Assistant Professor	Ms. Gabriella Emri M.D., Ph.D.
	Krisztián Gáspár M.D., Ph.D.
	Dániel Törőcsik M.D., Ph.D.
Assistant Lecturer	Ms. Edina Bodnár M.D.
	Ms. Emese Herédi M.D.
	Ms. Borbála Kiss M.D., Ph.D.
Clinical Assistant	Ms. Irén Erdei M.D.
	Ms. Annamária Filep M.D.
	Ms. Emese Gellén M.D.
	Ms. Irina Sawhney M.D.
Candidate Clinical Assistant	Ms. Anikó Csordás M.D.
	Ms. Judith Kriszta Kékedy M.D.
	Péter Kósa M.D.
	Ms. Zita Kovács M.D.

		Endre Nagy Jr. M.D.
	Ms.	Lilla Paragh M.D.
	Ms.	Anita Rácz M.D.
	Ms.	Georgina Szima M.D.
	Ms.	Tünde Várvölgyi M.D.
Resident	Ms.	Krisztina Hajdu M.D.
	Ms.	Lilla Pogácsás M.D.
	Ms.	Annamária Szödényi M.D.
	Ms.	Zita Zatik M.D.
Senior Consultant		Zoltán Péter M.D.
Academic Advisor of Faculty of Medicine	Ms.	Éva Szabó M.D., Ph.D.
Academic Advisor of Faculty of Dentistry		István Juhász M.D., Ph.D., C.Sc.

DEPARTMENT OF INTERNAL MEDICINE
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-525

Full Professor, Head of Department		György Paragh M.D., Ph.D., D.Sc.
Education Officer, Contact Person		Péter Fülöp M.D., Ph.D.

Division of Angiology
Móricz Zs. krt. 22., Debrecen, 4032, Tel: +3652255480

Full Professor, Head of Division		Pál Soltész M.D., Ph.D., D.Sc.
Assistant Professor	Ms.	Katalin Veres M.D., Ph.D.
Chief Physician	Ms.	Edit Szomják M.D.
	Ms.	Franciska Tizedes M.D.
Clinical Specialist		Ervin Sochka M.D.
Resident	Ms.	Ágnes Dioszegi M.D.
Invited Lecturer	Ms.	Renáta Laczik M.D., Ph.D.
		Richárd Veisz M.D.
PhD Student		Dávid Kovács M.D.
	Ms.	Melinda Vass M.D.

Division of Clinical Immunology

Nagyerdei krt. 98, Debrecen, 4012, Tel: 06-52-255-218

Full Professor, Head of Division	Ms.	Margit Zeher M.D., Ph.D., D.Sc.
Full Professor	Ms.	Edit Bodolay M.D., Ph.D., D.Sc.
	Ms.	Katalin Dankó M.D.,Ph.D.,D.Sc.
Associate Professor		Zoltán Csiki M.D., Ph.D.
		János Gaál M.D.,Ph.D.
Assistant Professor		Zoltán Griger M.D., Ph.D.
	Ms.	Antónia Szántó M.D., Ph.D.
	Ms.	Tünde Tarr M.D., Ph.D.
Assistant Lecturer	Ms.	Ildikó Horváth M.D.
	Ms.	Éva Zöld M.D., Ph.D.
Senior Research Fellow		Gábor Papp M.D., Ph.D.
Biologist	Ms.	Krisztina Szabó M.D.
Clinical Specialist	Ms.	Gyöngyike Emese Majai M.D., Ph.D.
Candidate Clinical Assistant	Ms.	Melinda Nagy-Vincze M.D.
Resident	Ms.	Nikolett Farmasi M.D.
	Ms.	Katalin Husi M.D.
	Ms.	Szilvia Lovas M.D.
	Ms.	Bianka Perge M.D.
	Ms.	Borbála Székely M.D.
PhD Student	Ms.	Ilona Jámbor M.D.
		Chen Ji-Qing M.D.
Educational Advisor		Zoltán Griger M.D., Ph.D.
	Ms.	Tünde Tarr M.D., Ph.D.

Division of Emergency Medicine

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-411-717/50190
E-mail: ujvarosy.andras@mentok.hu

Associate Professor, Head of Division		Zoltán Szabó M.D., Ph.D.
Associate Professor		István Lőrincz M.D., Ph.D.
Assistant Professor	Ms.	Dóra Ujvárosy M.D.
		Zoltán Vincze M.D., Ph.D.
Candidate Clinical Assistant		Tamás Köbling M.D.

Resident		Zoltán Szegedi M.D.
		Szabolcs Tóth M.D.
Invited Lecturer	Ms.	Tímea Boros M.D.
		Gergely Nagy M.D.
		Tamás Ötvös M.D.
	Ms.	Margit Petrus M.D.
		Zoltán Szatmári M.D.
		Sándor Szima M.D.

Division of Endocrinology

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-600

Full Professor, Head of Division		Endre Nagy M.D., Ph.D., D.Sc.
Professor Emeritus		András Leövey M.D., Ph.D., D.Sc.
Associate Professor		Miklós Bodor M.D., Ph.D.
Assistant Lecturer	Ms.	Mária Juhász M.D., Ph.D.
Chief Consultant	Ms.	Judit Boda M.D.
Clinical Assistant	Ms.	Annamária Erdei M.D.
	Ms.	Annamária Gazdag M.D.
	Ms.	Andrea Gazsó M.D.
	Ms.	Ildikó Hircsu M.D.
	Ms.	Lívia Sira M.D.
Resident		Sándor Halmi M.D.

Division of Gastroenterology

Nagyerdei krt. 98., Debrecen, 4012, Tel: +36-52-255-601

E-mail: altorjay@med.unideb.hu

Associate Professor, Head of Division		István Altorjay M.D., Ph.D.
Associate Professor	Ms.	Mária Papp M.D., Ph.D.
		István Tornai M.D.,Ph.D.
Assistant Professor		Tamás Bubán M.D.
		Károly Palatka M.D., Ph.D.
	Ms.	Zsuzsa Vitális M.D., Ph.D.
Chief Consultant		Csaba Várvölgyi M.D.
Clinical Specialist	Ms.	Boglárka Haraszti M.D.
		Sándor Kacska M.D.

Registrar		László Dávida M.D. (Gastroenterology)
	Ms.	Ildikó Földi M.D. (on maternity leave)
	Ms.	Eszter Pályu M.D. (Internal Medicine)
		Tamás Tornai M.D. (Internal Medicine)

Division of Geriatry

Nagyerdei krt. 98, Debrecen, 4012, Tel: 06-52-255-218

Full Professor, Head of Division		Gyula Bakó M.D., Ph.D., D.Sc.
Clinical Doctor	Ms.	Adrienn Szabó M.D.

Division of Haematology

Nagyerdei krt. 98, Debrecen, 4012, Tel: 06-52-255-152/55152
E-mail: illesarpaddr@gmail.com, Web: 2bel.med.unideb.hu

Full Professor, Head of Division		Árpád Illés M.D., Ph.D., D.Sc.
Full Professor		Miklós Udvardy M.D., Ph.D., D.Sc.
Associate Professor		László Váróczy M.D., Ph.D.
Assistant Professor		Péter Batár M.D., Ph.D.
		Lajos Gergely M.D., Ph.D., D.Sc.
	Ms.	Zsófia Miltényi M.D., Ph.D.
		László Rejtő M.D., Ph.D.
Assistant Lecturer	Ms.	Zsófia Simon M.D., Ph.D.
		Róbert Szász M.D.
Research Fellow	Ms.	Marianna Szarvas
Clinical Specialist	Ms.	Gabriella Mezei M.D.
		Gyula Reményi M.D.
	Ms.	Zsófia Ujj M.D.
Registrar		Ferenc Magyari M.D.
	Ms.	Edit Páyer M.D.
Resident		Ádám Jóna M.D.
PhD Student	Ms.	Adrien Márton M.D.
	Ms.	Zita Radnay M.D.

Division of Metabolism

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-600

Full Professor, Head of Division of Metabolism		György Paragh M.D., Ph.D., D.Sc.
Full Professor		Dénes Páll M.D., Ph.D., D.Sc.
Associate Professor		Zoltán Balogh M.D., Ph.D.
		Péter Fülöp M.D., Ph.D.
	Ms.	Mariann Harangi M.D., Ph.D.
		Miklós Káplár M.D., Ph.D.
	Ms.	Éva Katona M.Sc.
Assistant Professor		Péter Koncsos M.D.
		Sándor Somodi M.D., Ph.D.
Assistant Lecturer		Tamás Köbling M.D.
Chief Consultant		Attila Szűcs M.D., Ph.D.
Senior Research Fellow		Zsolt Karányi M.Sc.
	Ms.	Ildikó Seres M.Sc., Ph.D.
Biologist	Ms.	Mónika Katkó M.D.
Clinical Assistant	Ms.	Tímea Besenyei M.D.
	Ms.	Henrietta Dér M.D.
	Ms.	Krisztina Gaál M.D.
	Ms.	Andrea Kahler M.D.
	Ms.	Judit Kéri M.D.
	Ms.	Ilona Enikő Kovács M.D.
	Ms.	Julianna Kulcsár M.D.
		Szabolcs Lengyel M.D.
	Ms.	Alida Magdolna Páll M.D.
	Ms.	Ildikó Szántó M.D.
		Ferenc Sztanek M.D.
Candidate Clinical Assistant	Ms.	Regina Esze M.D.
		Imre Juhász M.D.
	Ms.	Eszter Kusicza M.D.
		György Nagy M.D.
	Ms.	Réka Szentimrei M.D.
	Ms.	Noémi Zsíros M.D.

Resident	Ms.	Lilla Juhász M.D.
	Ms.	Judit Kaluha M.D.
		Balázs Mata M.D.
PhD Student	Ms.	Anita Szentpéteri
	Ms.	Viktória Varga

Division of Nephrology
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-414-227

Full Professor, Head of Division of Nephrology		József Balla M.D., Ph.D., D.Sc.
Professor Emeritus		György Kakuk M.D., Ph.D.
Associate Professor		István Kárpáti M.D., Ph.D.
		János Mátyus M.D., Ph.D.
		László Újhelyi M.D., Ph.D.
Clinical Assistant	Ms.	Mária Juhász M.D., Ph.D.
	Ms.	Réka P. Szabó M.D.
	Ms.	Klára Pucsok M.D.
	Ms.	Zita Váradi M.D.
Senior Consultant	Ms.	Csilla Trinn M.D.

Division of Rare Diseases
Nagyerdei krt. 98, Debrecen, 4012, Tel: 06-52-411-717/55196
E-mail: g.pfliegler@gmail.com, Web: 2bel.med.unideb.hu

Associate Professor, Head of Division		György Pfliegler M.D., Ph.D.
Assistant Lecturer	Ms.	Boglárka Brúgós M.D., Ph.D.
Clinical Specialist		Krisztián Urbán M.D.
Registrar		György Kovács M.D.
Invited Lecturer	Ms.	Erzsébet Kovács M.D.

Division of Rheumatology
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-091
E-mail: reuma.titkarsag@med.unideb.hu, Web: www.rheumatology.hu

Full Professor, Head of Division		Zoltán Szekanecz M.D., Ph.D., D.Sc.
Full Professor	Ms.	Gabriella Szűcs M.D., Ph.D.
Associate Professor		Sándor Szántó M.D.,Ph.D.

Assistant Professor	Ms.	Szilvia Szamosi M.D.,Ph.D.
Assistant Lecturer	Ms.	Nóra Bodnár M.D.
	Ms.	Edit Végh M.D.
Clinical Specialist	Ms.	Katalin Gulyás M.D.
	Ms.	Ágnes Horváth M.D.
	Ms.	Zsófia Pethő M.D.
Resident	Ms.	Ágnes Kovács Ph.D.
	Ms.	Boglárka Soós M.D.

DEPARTMENT OF MEDICAL IMAGING

Nagyerdei krt. 98, Debrecen, 4032, Tel: +36-52-255-510

Full Professor, Head of Department		Ervin Berényi M.D., Ph.D.

Division of Nuclear Medicine and Translational Imaging

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-510
E-mail: nmiroda@med.unideb.hu, Web: http://petunia.atomki.hu/Learning

Full Professor		László Galuska M.D., D.Sc.
Professor Emeritus		Lajos Trón M.Sc., Ph.D., D.Sc.
Associate Professor	Ms.	Ildikó Garai M.D., Ph.D.
		József Varga M.Sc., Ph.D.
Assistant Professor		György Trencsényi M.Sc., Ph.D.
Senior Research Fellow		László Balkay M.Sc., Ph.D.
		Miklós Emri M.Sc., Ph.D.
Research Fellow		István Kertész M.Sc., Ph.D.
		Dezső Szikra M.Sc., Ph.D.
Resident	Ms.	Zita Képes M.D.
Chemist	Ms.	Anikó Fekete M.Sc., Ph.D.
		István Jószai M.Sc., Ph.D.
		Pál Mikecz M.Sc.
	Ms.	Tünde Miklovicz M.Sc.
	Ms.	Enikő Németh Várhalminé M.Sc.
	Ms.	Judit Péliné Szabó M.Sc.
		Norbert Pótári M.Sc.
		Béla Rubleczky M.Sc.

Pharmacist	Ms.	Viktória Arató D.Pharm.
	Ms.	Zsuzsanna Ésik D.Pharm.
		Gergely Farkasinszky D.Pharm.
Physicist		Gábor Opposits M.Sc., Ph.D.
		László Pohubi M.Sc.
Specialist		Zoltán Barta M.D.
Invited Lecturer		Sándor Kristóf Barna M.D.
	Ms.	Nikol Fedinecz M.D.
PhD Student		Csaba Aranyi M.Sc.
	Ms.	Mónika Béresová M.Sc.
		Attila Forgács M.Sc.
Academic Advisor		László Balkay M.Sc., Ph.D.

Division of Radiology and Imaging Science

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-136
E-mail: gallasz.szilvia@med.unideb.hu, Web: radiologia.unideb.com

Full Professor, Head of Department		Ervin Berényi M.D., Ph.D.
Professor Emeritus		Mózes Péter M.D., Ph.D.
Professor		József Kollár M.D., Ph.D., C.Sc.
Assistant Professor		Péter Bágyi M.D.
		Gábor Endes M.D.
		Botond Karácsonyi M.D.
	Ms.	Éva Pásztor M.D.
College Associate Professor	Ms.	Réka Révészné Tóth M.Sc., Ph.D.
Assistant Lecturer		Szabolcs Hetényi M.D.
		István Lázár M.Sc., Ph.D.
Senior Lecturer	Ms.	Judit Tóth M.D.
Clinical Assistant		Levente István Lánczi M.D.
Resident	Ms.	Melinda Bán M.D.
	Ms.	Veronika Deczkiné Gaál M.D.
	Ms.	Zsuzsanna Ferenczi M.D.
	Ms.	Edina Kósik M.D.
		Ádám Leskó M.D.
	Ms.	Georgina Nagy M.D.
		Tamás Papp M.D., Ph.D.

		Máté Sik M.D.
	Ms.	Orsolya Szalmás M.D.
	Ms.	Anita Tresó M.D.
	Ms.	Nikoletta Vasas M.D.
Molecular Biologist	Ms.	Teréz Nyesténé Nagy B.Sc.
Analytical Chemist		Ervin Balázs
	Ms.	Eszter László
		Gergő Veres
PhD Student	Ms.	Mónika Béresová M.Sc.
		Péter Katona M.D.
		Kázmér Kovács M.D.
		Attila Laczovics M.Sc.
	Ms.	Szilvia Lakatos
	Ms.	Marianna Nagy M.Sc.
	Ms.	Edit Nagy M.D.
		András Székely M.D.
Academic Advisor	Ms.	Éva Pásztor M.D.

DEPARTMENT OF NEUROLOGY

Móricz Zs. str. 22., Debrecen, 4032, Tel: +36-52-255-255
E-mail: iroda@med.unideb.hu ; csiba@med.unideb.hu

Full Professor, Head of Department		László Csiba M.D., Ph.D., D.Sc., M.H.A.Sc.
Full Professor		István Fekete M.D.
Professor Emeritus		Ferenc Mechler M.D., Ph.D., D.Sc.
Associate Professor	Ms.	Tünde Csépány M.D., Ph.D.
	Ms.	Tünde Magyar M.D., Ph.D.
		László Oláh M.D., Ph.D.
Assistant Professor	Ms.	Judit Boczán M.D., Ph.D.
	Ms.	Klára Fekete M.D., Ph.D.
		Bertalan Vámosi M.D.
Assistant Lecturer	Ms.	Krisztina Csapó M.D., Ph.D.
	Ms.	Katalin Réka Kovács M.D., Ph.D.
		Norbert Kozák M.D., Ph.D.
		Zsolt Mezei M.D., Ph.D.

	Ms.	Szilvia Puskás M.D.,Ph.D.
Clinical Assistant	Ms.	Anita Frendl M.D.
	Ms.	Edina Kovács M.D.
	Ms.	Katalin Szabó M.Sc.
Candidate Clinical Assistant		Szabolcs Farkas M.D., Ph.D.
		Gergely Hofgárt M.D.
	Ms.	Kitti Bernadett Kovács M.D.
Resident	Ms.	Lilla Rácz M.D.
PhD Student	Ms.	Aletta Harmann M.D.
	Ms.	Csilla Vér

DEPARTMENT OF NEUROSURGERY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-419-418

Full Professor, Head of Department	László Bognár M.D., Ph.D.
Associate Professor	Álmos Klekner M.D., Ph.D.
	László Novák M.D., Ph.D.
	Sándor Szabó M.D., Ph.D.
Clinical Assistant	József Dobai M.D.
	Péter Ruszthi M.D.
	Rahmani Mohammad Tayeb M.D.
Resident	Emanuel Gutema M.D.
	Gábor Hutóczki M.D.
	Máté Kiss M.D.
PhD Student	Meyssam Amirinejad M.D.
Academic Advisor	László Novák M.D., Ph.D.

DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-144
E-mail: gyvarga@med.unideb.hu

Full Professor, Head of Department	Róbert Póka M.D., Dr. habil., Ph.D.
Full Professor	Zoltán Hernádi M.D., Ph.D., D.Sc.
	Zoltán Tóth M.D., Ph.D., D.Sc.
Professor Emeritus	Antal Borsos M.D., Ph.D., D.Sc.
	László Lampé M.D., Ph.D., D.Sc.
Associate Professor	Attila Jakab M.D., Ph.D.

		Tamás Szilveszter Kovács M.D., Ph.D.
		Tamás Major M.D., Ph.D.
	Ms.	Olga Török M.D., Ph.D.
Assistant Professor		László Birinyi M.D., Ph.D.
		Roland Csorba M.D., Ph.D.
		Alpár Gábor Juhász M.D., Ph.D.
		Zoárd Krasznai M.D., Ph.D.
		Rudolf Lampé M.D., Ph.D.
		Csaba Móré M.D., Ph.D.
		Tamás Sápy M.D., Ph.D.
	Ms.	Szilvia Vad M.D., Ph.D.
Assistant Lecturer		Péter Daragó M.D.
		Tamás Deli M.D., Ph.D.
		János Lukács M.D.
		Péter Török M.D., Ph.D.
Biologist	Ms.	Zsuzsanna Buczkó M.Sc.
	Ms.	Ildikó Zsupán M.Sc.
Clinical Assistant		István Argay M.D.
		Balázs Erdődi M.D.
	Ms.	Ágnes Farkas M.D.
		István Fekete M.D.
	Ms.	Judit Kerepesi M.D.
		Bence Kozma M.D.
		László Orosz M.D.
		Jashanjeet Singh M.D.
Candidate Clinical Assistant		Péter Damjanovich M.D.
	Ms.	Eszter Maka M.D.
		Szabolcs Molnár M.D.
		Gergő Orosz M.D.
Resident		Levente Barna M.D.
	Ms.	Szilvia Csehely M.D.
		Zsolt Farkas M.D.
	Ms.	Orsolya Nagyházi M.D.
	Ms.	Mónika Orosz M.D.
	Ms.	Lilla Ördög M.D.

		Attila Sipos M.D.
Psychologist	Ms.	Zsuzsa Török M.A., Ph.D.
Academic Advisor (IV. Year)		Tamás Szilveszter Kovács M.D., Ph.D.
Academic Advisor (VI. year)		Tamás Major M.D., Ph.D.

Division of Gynecological Oncology
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-417-144

Full Professor, Head of Division of Gynecologic Oncology		Róbert Póka M.D., Dr. habil., Ph.D.
Full Professor		Zoltán Hernádi M.D., Ph.D., D.Sc.
Professor Emeritus		László Lampé M.D., Ph.D., D.Sc.
Assistant Professor		Zoárd Krasznai M.D., Ph.D.

DEPARTMENT OF OPHTHALMOLOGY
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-456

Full Professor, Head of Department		András Berta M.D., Ph.D., D.Sc.
Full Professor		László Módis M.D., Ph.D., D.Sc.
Associate Professor	Ms.	Judit Damjanovich M.D., Ph.D.
		Ádám Kemény-Beke M.D., Ph.D.
	Ms.	Valéria Nagy M.D., Ph.D.
	Ms.	Lili Takács M.D., Ph.D.
Assistant Professor	Ms.	Adrienne Csutak M.D., Ph.D.
	Ms.	Mariann Fodor M.D., Ph.D.
		Bence Lajos Kolozsvári M.D., Ph.D.
		Gergely Losonczy M.D., Ph.D.
Assistant Lecturer	Ms.	Beáta Kettesy M.D.
	Ms.	Zita Steiber M.D., Ph.D.
	Ms.	Éva Surányi M.D.
	Ms.	Bernadett Ujhelyi M.D.,Ph.D.
		Attila Vajas M.D.
Clinical Specialist	Ms.	Beáta Kettesy M.D., Ph.D.
	Ms.	Annamária Nagy M.D.
	Ms.	Erika Papp M.D.
Resident		Szabolcs Balla M.D.

	Ms.	Anikó Rentka M.D., Ph.D.
	Ms.	Eszter Zöld M.D.
PhD Student	Ms.	Eszter Deák M.D., M.Sc.
	Ms.	Orsolya Orosz M.D.
	Ms.	Dorottya Pásztor M.D.
	Ms.	Melinda Turáni

DEPARTMENT OF ORTHOPEDIC SURGERY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-815
E-mail: zjonas@med.unideb.hu, Web: www.ortopedia.dote.hu

Full Professor, Head of Department		Zoltán Csernátony M.D., Ph.D., D.Sc.
Professor Emeritus		János Rigó M.D., Ph.D.
		Kálmán Szepesi M.D., Ph.D., D.Sc.
Assistant Professor		Zoltán Jónás M.D.
		János Szabó M.D.
Assistant Lecturer		Tamás Bazsó M.D.
		Gyula Győrfi
		Zsolt Hunya M.D.
		Zoltán Karácsonyi M.D.
		László Kiss M.D.
		Henrik Rybaltovszki M.D.
	Ms.	Csenge Szeverényi M.D.
Clinical Assistant		István Soltész M.D.

DEPARTMENT OF PEDIATRICS

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-411-717/55289
E-mail: mogyoros@med.unideb.hu, Web: www.pediatrics.dote.hu

Full Professor, Head of Department		György Balla M.D., Ph.D., D.Sc., M.H.A.Sc.
Full Professor, Head of Division of Pediatric Haematology and Oncology		Csongor Kiss M.D., Ph.D., D.Sc.
Full Professor	Ms.	Ilma Korponay-Szabó M.D., Ph.D.
Associate Professor, Head of Division of General Pediatrics		Gábor Mogyorósy M.D., Ph.D.
Associate Professor, Head of Division of	Ms.	Rita Káposzta M.D., Ph.D.

Pediatric Emergency Care		
Associate Professor		István Csízy M.D., Ph.D.
	Ms.	Ilona György M.D., Ph.D.
		Gábor Mogyorósy M.D., Ph.D.
		Béla Nagy M.D., Ph.D.
	Ms.	Éva Nemes M.D., Ph.D.
		Tamás Szabó M.D., Ph.D.
		István Szegedi M.D., Ph.D.
Assistant Professor	Ms.	Enikő Felszeghy M.D.,Ph.D.
	Ms.	Katalin Szakszon M.D., Ph.D.
	Ms.	Judit Tóth M.D.
Assistant Lecturer	Ms.	Erika Bálega M.D.
	Ms.	Andrea Berkes M.D., Ph.D.
	Ms.	Ágnes Papp M.D.
		István Pataki M.D.
		László Sasi Szabó M.D.
Emeritus	Ms.	Éva Oláh M.D., Ph.D., D.Sc.
Senior Lecturer	Ms.	Andrea Nagy M.D.
Clinical Assistant		Zsolt Bene M.D.
		Gábor Garai M.D.
		Imre Gáspár M.D.
	Ms.	Éva Juhász M.D.
	Ms.	Orsolya Kadenczki M.D.
	Ms.	Erzsébet Ilona Lakatos M.D.
	Ms.	Ágnes Magyar M.D.
	Ms.	Edina Mák M.D.
		Zsolt Reiger M.D.
Resident	Ms.	Edina Bányász M.D.
	Ms.	Bernadett Bíró M.D.
	Ms.	Beáta Bujdosó M.D.
	Ms.	Anita Gertrud Czifra M.D.
	Ms.	Klára Erdei M.D.
	Ms.	Boglárka Fehér M.D.
	Ms.	Anita Grabicza M.D.
	Ms.	Réka Jancsik M.D.

		Péter Juhász M.D.
	Ms.	Nóra Kicska M.D.
	Ms.	Eszter Kovács M.D.
		András Kretzer M.D.
	Ms.	Lilla Macsi M.D.
	Ms.	Katalin Nagy M.D.
	Ms.	Helga Perényi M.D.
	Ms.	Boglárka Schvarckopf M.D.
	Ms.	Orsolya Somodi M.D.
	Ms.	Vivien Stercel M.D.
		Levente Szabó M.D.
	Ms.	Lilla Szegedi M.D.
	Ms.	Anna Szőllős M.D.
	Ms.	Flóra Ujhelyi M.D.
	Ms.	Zsuzsa Zele M.D.
Psychologist	Ms.	Erika Tizedes
Academic Advisor		Gábor Mogyorósy M.D., Ph.D.
		Tamás Szabó M.D., Ph.D. (for GMC students - 5th and 6th year)

Division of Neonatology
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-411-600

Full Professor, Head of Division of Neonatology		György Balla M.D., Ph.D., D.Sc.
Assistant Lecturer		Zsolt Horváth M.D.
	Ms.	Judit Kovács M.A.
	Ms.	Edit Polonkai M.D.
Clinical Assistant		Gergely Balázs M.D.
		Norbert Elek M.D.
	Ms.	Nóra Katona M.D.
	Ms.	Tünde Kotormán M.D.
		Tamás Kovács M.D.
		Balázs Kovács-Pászthy M.D.
	Ms.	Magdolna Riszter M.D.
	Ms.	Brigitta Sveda M.D.

Academic Advisor		Zsolt Horváth M.D. (Ext.: 55454)

DEPARTMENT OF PHYSICAL MEDICINE AND REHABILITATION

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-942
E-mail: orfmt@med.unideb.hu, Web: http://rehabilitacio.med.unideb.hu

Head of Department, Associate Professor		Zoltán Jenei M.D., Ph.D.
Associate Professor	Ms.	Zsuzsanna Vekerdy-Nagy M.D., Ph.D. habil. (retired)
Clinical Specialist	Ms.	Ágnes Bajusz-Leny M.D.
	Ms.	Judit Horváth M.D.
	Ms.	Rita Szepesi M.D.
Resident	Ms.	Adél Nagy M.D.
	Ms.	Lilla Szabó M.D.
Neuro-psychologist	Ms.	Györgyi Lente M.Sc.
Psychologist	Ms.	Noémi Zsuzsanna Kovács M.Sc.
Speech Therapist	Ms.	Noémi Fejér M.A.
	Ms.	Ildikó Mózesné Kapocska M.A.
	Ms.	Adrienn Polonkai M.A.
Physiotherapist	Ms.	Szabina Antal M.A.
	Ms.	Zsuzsa Bodnár M.A.
	Ms.	Kitti Boros, M.A.
	Ms.	Bettina Burgond M.A.
	Ms.	Andrea Győrfiné Jánossy M.A.
	Ms.	Anna Kövérné Kurta M.A.
	Ms.	Gabriella Nagy M.A.
	Ms.	Szabina Nagy M.A.
	Ms.	Éva Anna Szabados M.A.
Physiotherapist, Occupational therapist and Rehabilitation expert	Ms.	Zsófia Hőgye M.A.
Rehabilitation expert	Ms.	Gabriella Nagy M.A.
Social Worker	Ms.	Julianna Kavaleczné Ilyés M.A.
IT Specialist	Ms.	Beáta Alíz Dézsi M.Sc.
Social Educator	Ms.	Szilvia Baksa M.A.

PhD Student	Ms.	Judit Horváth M.D.
	Ms.	Adél Nagy M.D.
	Ms.	Anna Sárközi M.D.

DEPARTMENT OF PSYCHIATRY
Nagyerdei krt. 98., Debrecen, 4012, Tel: +36-52-255-240

Head of Department		Ede Frecska M.D., M.A., Ph.D.
Associate Professor	Ms.	Anikó Égerházi M.D., Ph.D.
Assistant Professor		Roland Berecz M.D., Ph.D.
	Ms.	Theodóra Glaub M.D.
Assistant Lecturer		Csaba Móré E. M.D., Ph.D.
Clinical Assistant		Gábor Andrássy M.D.
	Ms.	Edina Cserép M.D.
		Attila Kovács
	Ms.	Erzsébet Magyar M.D.
	Ms.	Katalin Tolvay M.D.
Resident		Ágoston Gajdos M.D.
		Balázs Jeges M.D.
	Ms.	Annamária Nagy M.D.
		Bence Szerdahelyi M.D.
Psychologist	Ms.	Éva Gasparik M.A.
	Ms.	Lili Kövér M.A.
	Ms.	Emese Kulcsár M.A.
	Ms.	Ella Molnár M.A.
	Ms.	Andrea Ritz M.A.
Academic Advisor	Ms.	Réka Stébel

DEPARTMENT OF PULMONOLOGY
Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-222

Full Professor, Head of Department	Ms.	Mária Szilasi M.D., Ph.D.
Assistant Professor		Imre Varga M.D., Ph.D.
Assistant Lecturer	Ms.	Andrea Fodor M.D.
		Tamás Kardos M.D.
	Ms.	Angéla Mikáczó M.D.

	Ms.	Anna Sárközi M.D.
		Attila Vaskó M.D.
Chief Physician		László Brugós M.D., Ph.D.
Clinical Assistant	Ms.	Melinda Lajtos M.D.
		Attila Lieber M.D.
		Zoltán Örlős M.D.
	Ms.	Zsuzsa Papp M.D.
	Ms.	Ildikó Szűcs M.D.
Candidate Clinical Assistant		Attila Makai M.D.
	Ms.	Regina Szabó-Szűcs M.D.
Responsible for Educational Matters	Ms.	Andrea Fodor M.D.

DEPARTMENT OF SURGERY

Móricz Zs. krt. 22, Debrecen, 4032, Tel: +36-52-411-717/55316
Web: http://www.sebeszet.deoec.hu

Full Professor, Chairman	László Damjanovich M.D., Ph.D.
Head of Division of Gastroenterology - Oncology	László Damjanovich M.D., Ph.D.
Head Of Division Of Organ Transplantation	Balázs Nemes M.D., Ph.D.
Head of Division of Thoracic Surgery	István Takács M.D.,Ph.D.
Professor Emeritus	György Balázs M.D., Ph.D., D.Sc.
	Géza Lukács M.D., Ph.D., D.Sc.
	Péter Sápy M.D., Ph.D., D.Sc.
Consultant Surgeon	Zsolt Kanyári M.D.
	Sándor Olvasztó M.D.
	Sándor Sz. Kiss M.D.
Associate Professor	Zsolt Szentkereszty M.D., Ph.D.
	Miklós Tanyi M.D.,Ph.D.
Assistant Professor	Roland Fedor M.D., Ph.D.
	Ferenc Győry M.D., Ph.D.
	László Orosz M.D.
Assistant Lecturer	Tamás Dinya M.D.
	Attila Enyedi M.D.
	János Pósán M.D.

Clinical Assistant	Ms.	Mónika Andrási M.D.
		Csaba Bánfi M.D.
	Ms.	Fruzsina Bodnár M.D.
		Péter Boros M.D.
	Ms.	Adrienn Csiszkó M.D.
		János Deák M.D.
		Balázs Fülöp M.D.
		Gergely Kóder M.D.
		Csaba Kósa M.D.
		Dávid Kovács M.D.
		Sándor Mátyás Lencés M.D.
	Ms.	Krisztina Litauszky M.D.
		Gábor Martis M.D.
		Csaba Ötvös M.D.
	Ms.	Réka P. Szabó M.D.
		Zsolt Susán M.D.
		Károly Szabó M.D.
		Csongor Váradi M.D.
		Gergely Zádori M.D., Ph.D.
Resident		Zsolt Bachmann M.D.
	Ms.	Klaudia Balog M.D.
	Ms.	Dorina Bodnár M.D.
		Máté Farkas M.D.
	Ms.	Júlia Mészáros M.D.
		Gábor Mudriczki M.D.
		Péter Ferenc Nagy M.D.
		Máté Rózsahegyi M.D.
Academic Advisor		Tamás Dinya M.D.

Division of Operative Techniques and Surgical Research
Móricz Zs. krt. 22., Debrecen, 4032, Tel: +36-52-416-915
Web: www.surg.res.dote.hu

Head of Division, Associate Professor		Norbert Németh M.D., MBA, Ph.D.
Full Professor	Ms.	Irén Mikó M.D., Ph.D., C.Sc.
Professor Emeritus		István Furka M.D.,Ph.D.,D.Sc.

Assistant Professor		Ádám Deák D.V.M., Ph.D.
	Ms.	Katalin Pető M.D.,Ph.D.
Postgraduate Lecturer		Tamás Lesznyák M.D., D.Pharm.
	Ms.	Zsuzsanna Sarolta Magyar M.D.
	Ms.	Enikő Tóth M.D.
Head of Assistants (Operating Theatre)	Ms.	Erzsébet Ványolos M.Sc.
Central Veterinary		Ádám Deák D.V.M., Ph.D.
External Tutor	Ms.	Andrea Furka M.D., Ph.D.
	Ms.	Erzsébet Ildikó Takács M.D., Ph.D.
	Ms.	Adrienn Tóth-Martinez M.D.
Academic Advisor of Faculty of Medicine		Ádám Deák D.V.M., Ph.D.
	Ms.	Katalin Pető M.D.,Ph.D.
Academic Advisor of Faculty of Dentistry	Ms.	Zsuzsanna Sarolta Magyar M.D.
PhD Student	Ms.	Anita Mester M.D.
	Ms.	Viktória Sógor M.Sc.
Academic Advisor of Elective Courses		István Furka M.D., Ph.D., D.Sc.
	Ms.	Irén Mikó M.D., Ph.D., C.Sc.
Academic Advisor of Faculty of Pharmacy		Tamás Lesznyák M.D., D.Pharm.

DEPARTMENT OF UROLOGY

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-256
E-mail: benyomatyas@med.unideb.hu, Web: http://urologia.med.unideb.hu

Associate Professor, Head of Department	Tibor Flaskó M.D., Ph.D.
Professor Emeritus	Csaba Tóth M.D., Ph.D., D.Sc.
Associate Professor	Attila Varga M.D., Ph.D.
Assistant Professor	Mátyás Benyó M.D., Ph.D.
	Csaba Berczi M.D., Ph.D.
	Antal Farkas M.D., Ph.D.
Assistant Lecturer	Gyula Drabik M.D.
Chief Physician	László Lőrincz M.D.
Clinical Specialist	Mihály Murányi M.D.
	Krisztián Szegedi M.D.
	Sándor Árpád Tóth M.D.
Clinical Assistant	József Zoltán Kiss M.D.
	Dániel Varga M.D.

Responsible for Educational Matters	Mátyás Benyó M.D., Ph.D.

CHAPTER 9
DEPARTMENTS OF THE FACULTY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BOTANY

Egyetem tér 1., Debrecen, 4032, Tel: +36-52-512-900

Associate Professor, Head of Department		Gábor Vasas M.Sc., Ph.D.
Full Professor		György Borbély M.Sc., D.Sc.
Associate Professor		Gábor Matus M.Sc., Ph.D.
	Ms.	Ilona Mészáros M.Sc., Ph.D., C.Sc.
		Gábor Vasas M.Sc., Ph.D.
Assistant Professor	Ms.	Márta M-Hamvas M.Sc., Ph.D.
		Csaba Máthé M.Sc., Ph.D.
		Attila Molnár M.Sc., Ph.D.
		Viktor Oláh M.Sc., Ph.D., C.Sc.
		Gyula Surányi M.Sc., C.Sc.
Assistant Lecturer		Sándor Gonda M.Sc., D.Pharm.
Senior Research Fellow		János Kerékgyártó M.Sc., Ph.D., C.Sc.

Division of Pharmacognosy

Nagyerdei krt. 98., Debrecen, 4032, Tel: (+36 52) 512-900/62632
E-mail: vasas.gabor@science.unideb.hu, Web: http://www.pharmacognosy.unideb.hu/

Associate Professor, Head of Division	Gábor Vasas M.Sc., Ph.D.
Assistant Lecturer	Sándor Gonda M.Sc., D.Pharm.
Resident Pharmacist	Péter Parizsa M.Sc., D.Pharm.
Academic Advisor	Gábor Vasas M.Sc., Ph.D.

INSTITUTE OF CHEMISTRY

Egyetem tér 1., Debrecen, 4032, Tel: +3652512900

Head of Institute	László Somsák Ph.D., D.Sc.

Department of Applied Chemistry
Egyetem tér 1., Debrecen, 4032, Tel: +36-52-512-900
E-mail: alkkemia@science.unideb.hu

Full Professor, Head of Department		Sándor Kéki Ph.D., D.Sc., M.Sc.
Professor Emeritus		Miklós Zsuga Ph.D., D.Sc., M.Sc., C.Sc.
Associate Professor		György Deák M.Sc., Ph.D.
Assistant Professor		Miklós Nagy M.Sc., Ph.D.
		Lajos Nagy M.Sc., Ph.D.
		Sándor Nemes M.Sc., Ph.D.
Assistant Lecturer	Ms.	Erika Verner M.Sc.
Academic Advisor		Sándor Nemes M.Sc., Ph.D.

Department of Colloid- and Environmental Chemistry
Egyetem tér 1., Debrecen, 4032, Tel: +36-52-512-900
Web: http://dragon.unideb.hu/~kolloid/

Full Professor, Head of Department		István Bányai M.Sc., Ph.D., D.Sc.
Full Professor	Ms.	Noémi Nagy M.Sc., Ph.D.
Assistant Professor		Zoltán Nagy Ph.D.
		Levente Novák M.Sc., Ph.D.
Assistant Lecturer	Ms.	Mónika Kéri M.Sc.
		Zoltán Nemes M.Sc.
PhD Student		Bendegúz Lúcián Serra M.Sc.
Academic Advisor		Zoltán Nagy Ph.D.

Department of Inorganic and Analytical Chemistry
Egyetem tér 1., Debrecen, 4032, Tel: +36-52-512-900
E-mail: inorg@science.unideb.hu, Web: http://www.inorg.unideb.hu

Full Professor, Head of Department		István Fábián M.Sc., Ph.D., D.Sc.
Full Professor	Ms.	Katalin Erdődi-Kövér M.Sc., Ph.D., D.Sc., M.H.A.Sc.
		Gábor Lente M.Sc., Ph.D., D.Sc.
Professor Emeritus		Ernő Brücher Ph.D., D.Sc., M.Sc.
	Ms.	Etelka Farkas M.Sc., Ph.D., D.Sc.

		Lajos Papp M.Sc., Ph.D., D.Sc.
		József Posta M.Sc., Ph.D., D.Sc.
		Imre Sóvágó M.Sc., Ph.D., D.Sc.
		Imre Tóth Ph.D.,D.Sc.,M.Sc.
Associate Professor		Péter Buglyó M.Sc., Ph.D.
		Attila Gáspár M.Sc., Ph.D., D.Sc.
	Ms.	Gyöngyi Gyémánt M.Sc., Ph.D.
		István Lázár M.Sc., Ph.D.
		Zoltán Tóth M.D., Ph.D., D.Sc.
	Ms.	Katalin Várnagy M.Sc., Ph.D., D.Sc.
Assistant Professor		Gyula Tircsó M.Sc., Ph.D.
Senior Research Fellow	Ms.	Csilla Kállay M.Sc., Ph.D.
Research Fellow		Zsolt Baranyai M.Sc., Ph.D.
	Ms.	Edina Baranyai M.Sc., Ph.D.
		Gábor Bellér M.Sc., Ph.D.
	Ms.	Linda Bíró M.Sc., Ph.D.
	Ms.	Ágnes Grenács M.Sc., Ph.D.
		József Kalmár M.Sc., Ph.D.
Academic Advisor	Ms.	Katalin Várnagy M.Sc., Ph.D., D.Sc.

Department of Organic Chemistry
Egyetem tér 1., Debrecen, 4032, Tel: +36-52-512-900

Full Professor, Head of Department		László Somsák M.Sc., Ph.D., D.Sc.
Full Professor, Head of the Institute of Chemistry		László Somsák Ph.D., D.Sc.
Full Professor		Sándor Antus Ph.D., D.Sc.
		Gyula Batta Ph.D., D.Sc.
Associate Professor		László Juhász M.Sc., Ph.D.
		Tibor Kurtán M.Sc., Ph.D.
Assistant Professor	Ms.	Éva Bokor Ph.D.
	Ms.	Tünde Zita Tóthné Illyés Ph.D.
	Ms.	Tóth Marietta Vágvölgyiné Ph.D.
Assistant Lecturer	Ms.	Éva Juhászné Tóth M.Sc., Ph.D.

Department of Physical Chemistry /MTA-DE Homogeneous Catalysis and Reaction Mechanisms Research Group

Egyetem tér 1., Debrecen, 4010, Tel: +36-52-512-900/22381
Web: fizkem.unideb.hu/indexe

Full Professor		Vilmos Gáspár D.Sc.
		Ferenc Joó M.H.A.Sc.
Professor Emeritus		György Bazsa D.Sc.
		Mihály Beck D.Sc., M.H.A.Sc.
Associate Professor		Attila Bényei Ph.D.
	Ms.	Katalin Ősz Ph.D.
		György Póta C.Sc.
Assistant Lecturer	Ms.	Réka Gombos M.Sc.
Senior Research Fellow	Ms.	Henrietta Győrvári-Horváth Ph.D.
	Ms.	Ágnes Kathó C.Sc.
Research Fellow		Gábor Papp Ph.D.
		Mihály Purgel Ph.D.
		Antal Udvardy Ph.D.
Junior Research Fellow	Ms.	Csilla Enikő Czégéni Ph.D.
		István Pontos M.Sc.
Secretary	Ms.	Istvánné Román B.Sc.
PhD Student	Ms.	Evelin Bolyog-Nagy M.Sc.
		Péter Pál Fehér M.Sc.

INSTITUTE OF PHYSICS

Bem tér 18., Debrecen, 4032, Tel: +3652415222

Department of Environmental Physics of University of Debrecen and ATOMKI

Poroszlay u. 6., Debrecen, 4032, Tel: +36-52-509296
E-mail: csige@atomki.hu, Web: http://www.atomki.hu/deat/

Associate Professor	József Környei Ph.D.
Assistant Professor	Zoltán Papp Ph.D.

Department of Solid State Physics

Bem tér 18/b, Debrecen, 4026, Tel: +36-52-316 073
Web: ssphys.science.unideb.hu

Head of Department	István Szabó Ph.D., C.Sc.

CHAPTER 10
OTHER DEPARTMENTS

INSTITUTE OF BEHAVIOURAL SCIENCES, FACULTY OF PUBLIC HEALTH

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-255-594
Web: http://mti.dote.hu

Associate Professor, Head of Department	Ms.	Karolina Kósa M.D., M.Sc., Ph.D.
Associate Professor, Head of Division of Clinical And Health Psychology	Ms.	Ildikó Kuritár Szabó M.A., Ph.D.
Associate Professor, Head of Division of Humanities For Health Care		Attila Bánfalvi M.A., Ph.D., C.Sc.
Professor Emeritus		Péter Molnár M.D., D.Sc.
Associate Professor		Antal Bugán M.A., Ph.D.
Assistant Professor	Ms.	Mónika Andrejkovics M.A., Ph.D.
		Péter Kakuk M.A., Ph.D.
	Ms.	Judit Molnár M.A., Ph.D.
		Roland Tisljár M.A., Ph.D.
Assistant Lecturer		János Kristóf Bodnár M.A., Ph.D.
		Sándor Kőmüves M.A., Ph.D.
	Ms.	Eszter Tisljár - Szabó M.A., Ph.D.
Academic Advisor	Ms.	Mónika Andrejkovics M.A., Ph.D. (4th year, Behavioural Medicine, Behavioural Science Final Exam)
		Attila Bánfalvi M.A., Ph.D., C.Sc. (3rd year, Medical Anthropology, Medical Sociology)
		Péter Kakuk M.A., Ph.D. (4th year, Bioethics)
	Ms.	Judit Molnár M.A., Ph.D. (3rd year Medical Psychology, 5th year Pharmaceutical Psychology)
		Roland Tisljár M.A., Ph.D. (1st year, Basics of Behavioural Sciences, Communication)

DEPARTMENT OF FAMILY AND OCCUPATIONAL MEDICINE, FACULTY OF PUBLIC HEALTH

Móricz Zs. Krt. 22., Debrecen, 4032, Tel: +36-52-25-52-52
E-mail: csotanszek@sph.unideb.hu, Web: www.fam.med.unideb.hu www.nk.unideb.hu

Full Professor, Head of Department		Imre Rurik M.D., M.Sc., Ph.D., D.Sc.
Professor Emeritus		István Ilyés M.D., M.Sc., Ph.D.
Assistant Professor		Zoltán Jancsó M.D., Ph.D.
Assistant Lecturer	Ms.	Anna Nánási M.D.
	Ms.	Judit Szidor M.D.
	Ms.	Hajnalka Tamás M.D.
	Ms.	Tímea Ungvári M.Sc.
Undergraduate educational officer	Ms.	Tímea Ungvári M.Sc.

DEPARTMENT OF FOREIGN LANGUAGES

Nagyerdei krt. 98., Debrecen, 4032, Tel: +36-52-258-030
E-mail: ilekt@med.unideb.hu, Web: ilekt.med.unideb.hu

Head of Department	Ms.	Judit Lampéné Zsíros M.A., Ph.D.
Teacher	Ms.	Anna Balóné Jóna M.A.
	Ms.	Mariann Fodor M.D., Ph.D.
	Ms.	Ildikó Gerő M.A.
	Ms.	Mariann Gulyásné Szitás M.A.
	Ms.	Jusztina J. Nagy M.A.
	Ms.	Judit Kovács M.A.
	Ms.	Éva Kövesi M.A.
	Ms.	Mónika Krasznai M.A.
	Ms.	Zsuzsa Lívia Mezei M.A.
		László Répás M.A.
	Ms.	Katalin Rozman M.A.
		Tecumseh Stretch M.A.
Academic Advisor		László Répás M.A.

DEPARTMENT OF HEALTH MANAGEMENT AND QUALITY ASSURANCE, FACULTY OF PUBLIC HEALTH

Nagyerdei krt. 98., Debrecen, 4032, Tel: 06-52-255-052
E-mail: lepp.anett@med.unideb.hu, Web: www.emmt.unideb.hu

Associate Professor, Head of Department	Ms.	Klára Bíró D.M.D., Ph.D.
Associate Professor	Ms.	Judit Zsuga M.D., Ph.D.
Assistant Lecturer		Gábor Bányai-Márton J.D.
Strategic Advisor	Ms.	Judit Balogh M.Sc.
		Csaba Papp M.D., M.Sc.

DEPARTMENT OF PREVENTIVE MEDICINE, FACULTY OF PUBLIC HEALTH

Kassai út 26/b, Debrecen, 4028, Tel: +36-52-417-267

Full Professor, Head of Department	Ms.	Róza Ádány M.D., Ph.D., D.Sc.
Associate Professor, Head of Division		István Kárpáti M.D., Ph.D.
Full professor, Head of Biomarker Analysis Division	Ms.	Margit Balázs M.Sc., Ph.D., D.Sc.
Associate Professor, Head of Biostatistics and Epidemiology Division		János Sándor M.D., Ph.D.
Associate Professor, Head of Health Promotion Division	Ms.	Karolina Kósa M.D., M.Sc., Ph.D.
Associate Professor, Head of Dep. of Hygiene and Infection Control	Ms.	Piroska Orosi M.D., Ph.D.
Associate Professor		Balázs Ádám M.D., M.Sc., Ph.D.
	Ms.	Helga Bárdos M.D., M.Sc., Ph.D.
		Sándor Gődény M.D., Ph.D.
		Sándor Szűcs M.Sc., Ph.D.
Assistant Professor		Ervin Árnyas M.Sc., Ph.D.
	Ms.	Éva Bíró M.D., Ph.D.
	Ms.	Szilvia Fiatal M.D., Ph.D.
	Ms.	Orsolya Varga M.D., Ph.D.
Assistant Lecturer		Tibor Jenei
		Tamás Köbling M.D.
		Attila Csaba Nagy M.D., Ph.D.
		Károly Nagy Ph.D.

		László Pál Ph.D.
		Gábor Rácz M.D.
Academic Advisor		Sándor Szűcs M.Sc., Ph.D.

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INSTITUTE OF SPORT SCIENCE OF UNIVERSITY OF DEBRECEN

Móricz Zs. krt. 22., Debrecen, 4032, Tel: +36-52-411-600/54436
E-mail: sport@med.unideb.hu

Head of Department		László Balogh M.D.
Lecturer	Ms.	Katalin Jóna M.Sc.
		Miklós Magyarits M.A.
		Ágoston Nagy Ph.D.
	Ms.	Katalin Varga M.Sc.

CHAPTER 11
UNIVERSITY CALENDAR

UNIVERSITY CALENDAR FOR PHARMACY PROGRAM 2016/2017 ACADEMIC YEAR

CRASH COURSE OF HUNGARIAN LANGUAGE: August 29 - September 9, 2016
OPENING CEREMONY: September 11, 2016
PHARMACIST GRADUATION: June, 2017

1st SEMESTER

Year	Course	Examination Period
Basic Medicine Course	September 12 - December 23, 2016 (15 weeks)	December 27, 2016 - February 10, 2017 (7 weeks)
1st year Pharmacy 2nd year Pharmacy 3rd year Pharmacy 4th year Pharmacy	September 12 - December 23, 2016 (15 weeks)	December 27, 2016 - February 10, 2017 (7 weeks)
5th year Pharmacy	July 18- September 23, 2016 (2 months state exam practice) September 26 - December 23, 2016 (13 weeks)	December 27, 2016 – January 27, 2017 (5 weeks)

2nd SEMESTER

Year	Course	Examination Period
BMC	February 13 - May 26, 2017 (15 weeks)	May 29 - June 23, 2017 (4 weeks)
BMC II	January 09 - June 23, 2017 (24 weeks)	June 26 - July 14, 2017 (3 weeks)
1st year Pharmacy 2nd year Pharmacy 3rd year Pharmacy 4th year Pharmacy	February 13 – May 26, 2017 (15 weeks)	May 29 – July 14, 2017 (7 weeks)
5th year Pharmacy	January 30 –May 26, 2017 (4 months state exam practice)	

SUMMER PRACTICE

YEAR	DATE IN 2017
2^{nd} year Pharmacy practice	July 17 - August 11, 2017 or August 14 - September 8, 2017 (4 weeks)
3^{rd} year Pharmacy practice	July 17 - August 11, 2017 or August 14 - September 8, 2017 (4 weeks)

CHAPTER 12
ACADEMIC PROGRAM FOR THE BASIC MEDICINE COURSE

Basic Medicine Course (BMC, Premedical Studies)
Duration of studies: 1 year (2 semesters)

The one-year premedical Basic Medicine Course is recommended to those students who do not have sufficient knowledge in Biology, Physics and Chemistry from high school. The requirements in these premedical science subjects are rigorous, thus it is recommended that students who need a period of preparation prior to beginning the General Medicine, Dentistry or Pharmacy Program join the Basic Medicine Course. Students successfully completing the course are directly admitted to their chosen program. In addition to the Basic Medicine Course starting each September, our University launches an Intensive BMC in January as well.

Class Behavior

Students must not use cell phones to talk or text during class. Cell phones must be switched off or kept in silence mode during class. In seminars, students will be expected to participate in seminar discussions. Students are encouraged to ask questions related to the topic of the lectures discussed, and participate in solving problems related to the topic of the seminar. Some professors will ask for students to volunteer information, but some professors call on students randomly. It is, thus, a good idea to come to class prepared so as not to be embarrassed in front of the class. Students should not disrupt the class by talking to each other. If one continues to disrupt the class, the student may be asked to leave. The usage of electronic devices, textbooks and any form of interaction between students during the tests is strictly forbidden. Electronic devices (cell phones, tablets, dictionaries, etc.), except for approved simple calculators, must not be within the reach (in pocket, in the desk, etc.) of students during tests. It is the students' responsibility to stow these items before the test begins without specific warning by the supervising teachers. Violation of these above mentioned regulations results in an immediate and unconditional dismissal from the program.

Requirements

The 2-semester course consists of lectures and seminars. Attending lectures is strongly recommended, attendance of seminars is compulsory and recorded. Everyone must attend the seminars with the group designated by the Registrar's Office.

Absence can significantly affect your understanding and can have serious implications of progression in your studies. One might have a maximum of three seminar absences per semester to have the opportunity to get exemption. Students missing 4 seminars per semester cannot be exempted from the End of Semester Examination (ESE) or Final Examination (FE), regardless of their score reached on the Self Control Tests. Students missing 5 or more seminars per semester are dismissed from the course. Missed seminars cannot be made up, unless one obtains prior permission to be absent.

The knowledge of students will be tested 4 times during each semester using a written test system by **Self Control Tests (SCT).** The first semester is ended with an **End of Semester Examination** (ESE) covering the topics of all lectures and seminars of the first semester. Three dates will be set for the ESE during the winter examination period. Unsuccessful students may repeat the ESE twice (B and C chances). Non-repeater students who fail even the 3rd ESE (C chance) may continue their study in the second semester however they lose their chance to be exempted from the final examination and to receive bonus points. Exam exemption and bonus point

policy is used to improve the students' performance on SCTs. Exact details of these policies will be described below. To be eligible for bonus points, students must either get exemption from the ESE or pass it with a score of at least 50%. Students repeating the course must successfully pass the first semester either with exemption or at least with a score of 50% of ESE, otherwise their studies will be terminated. It is not compulsory to take the ESE, if one gets exemption under the following circumstances:
- one's average score of the three best first semester SCTs is at least 55%, AND
- (s)he successfully completed all the SCTs at least with 30% score, AND
- (s)he has a maximum of 3 seminar absences for each subject in the first semester.

The course ends with a **Final Exam (FE)** covering the whole material of the first and second semesters. A minimum of four FE dates will be set during the summer examination period. Unsuccessful students may repeat the FE twice (B and C chances, and the latter ends up with an oral examination part). Exemption from FE is offered for students who achieve excellent academic performance during their studies on the following base:
- the average score of the six best SCTs (out of 8) of the two semesters is at least 55%, AND
- passed all the SCTs with at least 30%, AND
- (s)he has a maximum of 3 seminar absences for a given subject per semester.

OR

- the average of the ESE score taken 3 times plus the scores of the 3 best SCTs in the 2nd semester is at least 55%, AND
- passed all the SCTs with at least 30%, AND
- (s)he has a maximum of 3 seminar absences for each subject per semester.

Bonus points will be added to the FE score (in %) of eligible students and calculated as follows:

The average of the ESE score three times and the best 3 2nd semester SCTs **OR** the average of the best 6 SCTs	Bonus points
51	1
52	3
53	5
54	7

Students who could not meet the above described conditions for exemption during the two semesters must sit for the FE from the whole material of the first and second semesters. The participation shall be preceded by ID confirmation (i.e. student's card, passport or driving license) before all forms of tests.
Self Control Tests, End of Semester Exams, and Final Exams will be assessed as follows.

Percentage (%)	Mark
0 - 49.99:	fail (1)
50.00 - 64.99:	pass (2)
65.00 - 74.99:	satisfactory (3)
75.00 - 84.99:	good (4)
85.00 - 100:	excellent (5)

Absence for any reason counts as 0%.

Course coordinator: Dr. Beáta Lontay, Department of Medical Chemistry

Subject: **INTRODUCTION TO BIOLOGY I.**
Year, Semester: Basic Medicine Course, 1st
Number of teaching hours:
Lecture: **60**
Seminar: **30**

1st **week:**
Lecture: The chemistry of life 1.
The chemistry of life 2.
Proteins, carbohydrates and lipids 1.
Proteins, carbohydrates and lipids 2.

2nd **week:**
Lecture: Proteins, carbohydrates and lipids 3.
Proteins, carbohydrates and lipids 4.
Nucleic acids and the origin of life 1.
Nucleic acids and the origin of life 2.

3rd **week:**
Lecture: Nucleic acids and the origin of life 3.
Cells: the working units of life 1.
Cells: the working units of life 2.
Cells: the working units of life 3.

4th **week:**
Lecture: Cells: the working units of life 4.
Energy, enzymes and metabolism 1.
Energy, enzymes and metabolism 2.
Cell membranes 1.

5th **week:**
Lecture: Cell membranes 2.
Cell membranes 3.
Cell membranes 4.
Pathways that harvest chemical energy 1.
Self Control Test

6th **week:**
Lecture: Pathways that harvest chemical energy 2.
Pathways that harvest chemical energy 3.
Pathways that harvest chemical energy 4.
Pathways that harvest chemical energy 5.

7th **week:**
Lecture: Pathways that harvest chemical energy 6.
Cell cycle and cell division 1.
Cell cycle and cell division 2.
Cell cycle and cell division 3.

8th **week:**
Lecture: Cell cycle and cell division 4.
Cell cycle and cell division 5.
Inheritance, genes and chromosomes 1.
Inheritance, genes and chromosomes 2.
Self Control Test

9th **week:**
Lecture: Inheritance, genes and chromosomes 3.
Inheritance, genes and chromosomes 4.
Inheritance, genes and chromosomes 5.
Inheritance, genes and chromosomes 6.

10th **week:**
Lecture: DNA and it’s role in heredity 1.
DNA and it’s role in heredity 2.
DNA and it’s role in heredity 3.
From DNA to protein: gene expression 1.

11th **week:**
Lecture: From DNA to protein: Gene expression 2.
From DNA to protein: gene expression 3.
From DNA to protein: gene expression 4.
Gene mutation and molecular medicine 1.

12th **week:**
Lecture: Gene mutation and molecular medicine2.
Gene mutation and molecular medicine 3.
Gene mutation and molecular medicine 4.
Gene mutation and molecular medicine 5.
Self Control Test

13th **week:**
Lecture: Regulation of gene expression 1.
Regulation of gene expression 2.
Regulation of gene expression 3.
The human genome, proteome

14th **week:**
Lecture: The mechanism of evolution 1.
The mechanism of evolution 2.
Cellular signaling and communication 1.
Cellular signaling and communication 2.

15th **week:**
Lecture: Fungi: recyclers, pathogens, parasites 1.
Fungi: recyclers, pathogens, parasites 2
Differential gene expression in development 1.
Differential gene expression in development 2.
Self Control Test

Contact person: Dr. András Penyige; Department of Human Genetics

Subject: **INTRODUCTION TO BIOLOGY II.**
Year, Semester: Basic Medicine Course, 2nd
Number of teaching hours:
Lecture: **45**
Seminar: **30**

1st **week:**
Lecture: Tissues, Organs and Organ Systems 1.
Tissues, Organs and Organ Systems 2.
Tissues, Organs and Organ Systems 3.

2nd **week:**
Lecture: Physiology, Homeostasis and Temperature Regulation.
Blood, a fluid tissue 1.
Blood, a fluid tissue 2.

3rd **week:**
Lecture: Circulatory systems 1.
Circulatory systems 2.
The human circulatory system 1.

4th **week:**
Lecture: The human circulatory system 2.
The lymphatic system.
Self Control Test

5th **week:**
Lecture: Natural Defenses against Disease 1.
Natural Defenses against Disease 2.
Natural Defenses against Disease 3.

6th **week:**
Lecture: Nutrition, Digestion and Absorption 1.
Nutrition, Digestion and Absorption 2.
Nutrition, Digestion and Absorption 3.

7th **week:**
Lecture: Nutrition, Digestion and Absorption 4.
Gas exchange in Animals.
-Human respiration.

8th **week:**
Lecture: Salt and Water Balance and Nitrogen Excretion 1.
Salt and Water Balance and Nitrogen Excretion 2.
Self Control Test

9th **week:**
Lecture: Hormones 1.
Hormones 2.
Hormones 3.

10th **week:**
Lecture: Hormones 4.
Hormones 5.
Neurons and Nervous system 1.

11th **week:**
Lecture: Neurons and Nervous system 2.
Neurons and Nervous system 3.
Neurons and Nervous system 4.
12th **week:**

Lecture: Neurons and Nervous system 5.
Sensory systems 1.
Sensory systems 2.

13th **week:**
Lecture: Self Control Test
Effectors: making Animals move 1.
Effectors: making Animals move 2.

14th **week:**
Lecture: Effectors: making Animals move 3.
Animal reproduction and Animal Development 1.
Animal reproduction and Animal Development 2.

15th **week:**
Lecture: Animal reproduction and Animal Development 3.
The human Reproduction System and Sexual Behavior.
Self Control Test

Contact person: Dr. Norbert Szentandrássy, Department of Physiology

Recommended book: Sadava, Hills, Heller, Berenbaum: Life (10th edition)

Subject: **INTRODUCTION TO BIOPHYSICS I.**
Year, Semester: Basic Medicine Course 1st
Number of teaching hours:
Lecture: **60**
Seminar: **30**

1st **week:**
Lecture: 1. Introduction to modern physics. Standards of length, mass, time.2. Conversion of units. Useful mathematics. Trigonometry.

2nd **week:**
Lecture: 3. Motion in one dimension, displacement, velocity, acceleration, motion diagrams.4. Freely falling objects.

3rd **week:**
Lecture: 5. Vectors and their properties. Components of vectors. Displacement, velocity and acceleration in two dimensions.6. Motion in two dimensions. Relative velocity.

4th **week:**
Lecture: 7. The laws of motion. Newton's First, Second and Third Law.8. Applications of Newton's Laws. Forces of friction.
Self Control Test (First SCT (Chapters 1-3))

5th **week:**
Lecture: 9. Energy. Work. Kinetic energy and the work-energy theorem. Gravitational potential energy.10. Spring potential energy. System and energy conservation. Power. Work done by varying forces.

6th **week:**
Lecture: 11. Momentum and impulse. Conservation of momentum.12. Collisions. Elastic and inelastic collisions.

7th **week:**
Lecture: 13. Angular speed and angular acceleration. Rotational motion under constant angular acceleration.14. Centripetal acceleration. Newtonian gravitation. Kepler's laws.

8th **week:**
Lecture: 15. Torque and the two conditions for equilibrium. The center of gravity.16. Rotational kinetic energy. Angular momentum.
Self Control Test (2nd SCT, Chapters 5-7)

9th **week:**
Lecture: 17. States of matter. Deformation of solids. The Youngs's, shear and bulk modulus.18. Density and pressure. Variation

of pressure with depth. Pressure measurements. Buoyant forces and Archimedes's principle. Fluids in motion.

10th **week:**
Lecture: 19. Temperature and the zeroth law of thermodynamics. Thermometers and temperature scales. Thermal expansion of solids and fluids.20. Macroscopic description of an ideal gas. The kinetic theory of gases.

11th **week:**
Lecture: 21. Energy in thermal processes. Heat and internal energy.22. Specific heat. Calorimetry. Latent heat and phase change.
Self Control Test (3rd SCT, Chapters 7-9)

12th **week:**
Lecture: 23. The first law of thermodynamics.24. The second law of thermodynamics. Entropy. Refrigerators and heat pumps.

13th **week:**
Lecture: 25. Elastic potential energy. Hook's law. Simple harmonic motion. Motion of a pendulum.26. Waves. Frequency, amplitude and wavelength. Interference of waves. Reflection of waves.

14th **week:**
Lecture: 27. Sound. Energy and intensity of sound waves. Shock waves, standing waves.28. Doppler effect. The ear and the principles of hearing.
Self Control Test (4th SCT, Chapters 10-13)
15th **week:**
Lecture: 29. Interactive seminar and preparation for ESE.30. Interactive seminar and preparation for ESE.

Subject: **INTRODUCTION TO BIOPHYSICS II.**
Year, Semester: Basic Medicine Course 2nd
Number of teaching hours:
Lecture: **60**
Seminar: **30**

1st **week:**
Lecture: 1. Properties of electric charges. Insulators and conductors. Coulomb's law.2. Electric field. Electric field lines. Electric flux and Gauss's law.

2nd **week:**
Lecture: 3. Electrical energy and capacitance.4. The parallel plate capacitor. Combinations of capacitors. Energy stored in capacitors. Capacitors with dielectric.

3rd **week:**
Lecture: 5. Electric current. Current and voltage measurements in circuits. Resistance and Ohm's law.6. Resistivity, temperature variation of resistance. Semiconductors and superconductors. Electrical activity of the heart. Defibrillators.

4th **week:**
Lecture: 7. Direct current circuits. Resistors in parallel and series.8. Kirchhoff's rules and complex DC circuits. RC circuits. Conduction of electrical signals by neurons.
Self Control Test (1st SCT, Chapters 15-17)

5th **week:**
Lecture: 9. Magnetism. Magnetic field. Earth's magnetic field. Magnetic force on current carrying conductors. Toque on current loop and electric motors.10. Magnetic field of a long straight wire and Ampere's law. Magnetic field between two parallel conductors. Magnetic field of loops and solenoids.

6th **week:**
Lecture: 11. Induced emf and magnetic flux. Faraday's law of induction. Motional emf.

Lenz's law.12. Generators. Self-inductance RL circuits.

7^{th} **week:**
Lecture: 13. Alternating current. Resistors, capacitors and inductors in AC circuits.14. The transformer. Properties of electromagnetic waves. The spectrum of electromagnetic waves.

8^{th} **week:**
Lecture: 15. The nature of light. Reflection, refraction and dispersion.16. Prisms. The rainbow. Huygen's principle. Total internal reflection and its medical applications.
Self Control Test (2nd SCT, Chapters 18-21)

9^{th} **week:**
Lecture: 17. Lenses and mirrors. Flat mirrors. Images formed by spherical mirrors. 18. Thin lenses. Images formed by lenses. Lens aberrations.

10^{th} **week:**
Lecture: 19. Wave optics. Conditions for interference, polarization of light. Diffraction.20. The camera, the simple magnifier, the compound microscope, the telescpoe and the eye.

11^{th} **week:**
Lecture: 21. Quantum physics. Blackbody radiation. Photoelectric effect. Particle theory of light.22. The production and attenuation of X-ray. Characteristic X-ray.
Self Control Test (3rd SCT, Chapters 22-25)

12^{th} **week:**
Lecture: 23. Atomic physics. Early model of the atom. Quantum mechanics and the hydrogen atom. The spin magnetic quantum numbers.24. Lasers and holography.

13^{th} **week:**
Lecture: 25. Some properties of the nuclei. Binding energy. Radioactivity, the decay processes. Medical application of radioactivity.26. Nuclear reactions. Nuclear fission and fusion. Positron and other antiparticles. Mesons and quarks.
Self Control Test (4th SCT, Chaptes 26-29)

14^{th} **week:**
Lecture: Preparation for the final exam.

15^{th} **week:**
Lecture: Final exam.

Contact person: Dr. Zoltán Varga, Department of Biophysics and Cell Biology

Recommended book: Serway, Vuille: College Physics (9^{th} edition)

Subject: **INTRODUCTION TO MEDICAL CHEMISTRY I.**
Year, Semester: Basic Medicine Course 1^{st}
Number of teaching hours:
Lecture: **60**
Seminar: **30**

1^{st} **week:**
Lecture: Introduction to general chemistry. Elements. Symbols for the elements. The SI system of measurement. Atoms. The structure of atoms. Nuclear arithmetic. Molecules and ions, compounds and mixtures.

2^{nd} **week:**
Lecture: Chemical formulas. Naming chemical compounds. Chemical equations. Avogadro’s number and the mole. Atomic, molecular and molar mass relationships. Stoichiometry: chemical arithmetic. Yields of chemical reactions. Empirical and molecular formulas.

3rd **week:**
Lecture: Light and the electromagnetic spectrum. Atomic spectra. The Bohr model of the hydrogen atom. The quantum mechanical model of the atom. Orbitals and quantum numbers. Quantum mechanics and atomic spectra.

4th **week:**
Lecture: Electron configurations and the periodic table. Classification of the elements. Representative and transition elements. The sizes of atoms and ions. Ionization energy, electron affinity, electronegativity.

5th **week:**
Lecture: FIRST SELF CONTROL TEST. Chemical bonds: metallic, ionic and covalent bonds. Electron-dot structures for molecular compounds and polyatomic ions.

6th **week:**
Lecture: Single and multiple covalent bonds. Valence bond theory. Molecular shapes: the VSEPR model. Hybridization. Intermolecular forces.

7th **week:**
Lecture: The gaseous state. Gases and gas pressure. The gas laws. The ideal gas law. Stoichiometric relationships with gases. Kinetic-molecular theory of gases. Liquid and solid states. Phase changes. Evaporation, vapor pressure, boiling point. The chemistry of water.

8th **week:**
Lecture: Electrolytes and nonelectrolytes. Solutions and their properties. Concentration of solutions. Units of concentration: molarity, mass percent, molality. Dilution of solutions. Some factors affecting solubility. Discussion of general chemistry 1.

9th **week:**
Lecture: SECOND SELF CONTROL TEST. Chemical equilibrium. The equilibrium constant. Factors that alter the composition of an equilibrium mixture.

10th **week:**
Lecture: Acids and bases. The pH in solutions of strong acids and strong bases. Equilibria in solutions of weak acids. Equilibria in solutions of weak bases. Relation between Ka and Kb.

11th **week:**
Lecture: Thermochemistry. Energy changes and energy conservation. Internal energy and state functions. Expansion work. Energy and enthalpy. The thermodynamic standard state. Hess's law. Chemical calculus.

12th **week:**
Lecture: THIRD SELF CONTROL TEST. Chemical reactions in perspective. Oxidation and reduction. Oxidation state. The activity series of the elements.

13th **week:**
Lecture: Balancing redox reactions. Galvanic cells. Discussion of general chemistry 2.

14th **week:**
Lecture: Introduction to the main group elements. Noble gases. Hydrogen. The s-block and p-block metals. The d-block metals.

15th **week:**
Lecture: FOURTH SELF CONTROL TEST. Summary and discussion.

Subject: **INTRODUCTION TO MEDICAL CHEMISTRY II.**
Year, Semester: Basic Medicine Course 2nd
Number of teaching hours:
Lecture: **60**
Seminar: **30**

1st **week:**
Lecture: The halogens. Compounds of the halogens. Oxygen. Substances with oxygen-oxygen bonds.

2nd **week:**
Lecture: Sulfur, compounds of sulfur. Industrial acids. Oxoacids. Nitrogen, nitrogen compounds, phosphorus, phosphorus compounds.

3rd **week:**
Lecture: Carbon and its inorganic compounds. Discussion of inorganic chemistry

4th **week:**
Lecture: FIFTH SELF CONTROL TEST. Covalent bonding in organic compounds. Alkanes.

5th **week:**
Lecture: Isomerism and reactions of alkanes. Cycloalkanes. Unsaturated hydrocarbons: alkenes and alkynes.

6th **week:**
Lecture: Aromatic compounds: the structure and properties of benzene and its derivates. Heteroatomic compounds. The reactions of benzene.

7th **week:**
Lecture: Organic halogen compounds. Alcohols and phenols.

8th **week:**
Lecture: SIXTH SELF CONTROL TEST. Ethers and organic sulfur compounds.

9th **week:**
Lecture: Aldehydes, ketones and quinones.

10th **week:**
Lecture: Nitrogen containing organic compounds: the structure and properties of amines. Basicity and reactions of amines. Heterocyclic amines. Amines of biological importance.

11th **week:**
Lecture: SEVENTH CONTROL TEST. Carboxylic acids. Saturated monocarboxylic acids. Unsaturated carboxylic acids. Dicarboxylic acids. Properties of carboxylic acids. Reactions of carboxylic acids.

12th **week:**
Lecture: Properties and reactions of carboxylic acids. Carboxylic acid derivatives: salts and detergents. Acyl halides, anhydrides.

13th **week:**
Lecture: Carboxylic acid derivatives: esters and amides. Substituted carboxylic acids. Stereochemistry. Optical activity: properties of enantiomers and diastereomers.

14th **week:**
Lecture: Absolute and relative configurations. Synthesis of enantiomers. Discussion of organic chemistry.

15th **week:**
Lecture: EIGHTH SELF CONTROL TEST. Summary and discussion.

Contact person: Dr. Endre Kókai, Department of Medical Chemistry

Recommended books: McMurry, Fay: Chemsitry (6th edition)
Erdődi, Csortos: Organic chemistry for premedical students (2010)

Subject: **HUNGARIAN LANGUAGE FOR BMC STUDENTS**
Year, Semester: Basic Medicine Course
Number of teaching hours:
Practical: **36**

1st week:
Practical: Introduction, The Hungarian alphabet, Vowel harmony; Ki vagy?

2nd week:
Practical: Köszönések. Personal pronouns, Conjugation of the verb "lenni".

3rd week:
Practical: Számok. Magyar pénz. How many? Ordinalnumbers.

4th week:
Practical: Hogy vagy? Word formation with "-ul, -ül".

5th week:
Practical: Mit csinálsz? Present tense verbal endings. Adverbs of time.

6th week:
Practical: Hová mész ma este? "Lenni" in past and future. Adverbs of place. (Optional: Past tense) Revision Mid-term test.
Self Control Test

7th week:
Practical: Mit kérsz? Informal you "ön/maga". Object of the sentence. (Optional: 13. leckéből a Zöldségboltban c. dialógus, zöldségek, gyümölcsök neve)

8th week:
Practical: Kérsz egy kávét? Word formation. Plural marker.

9th week:
Practical: Tud/akar/szeret/szeretne gitározni. Infinitive. (Optional: Milyen idő van ma?)

10th week:
Practical: Postán, vasútállomáson; Tetszik a ruhád;

11th week:
Practical: Az emberi test Milyen szeme van? Revision

12th week:
Practical: Oral minimum requirement exam. End-term test.

Requirements

Attendance
Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. Being late is counted as an absence. If the number of absences is more than two, the final signature is refused and the student must repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.

Testing, evaluation
In each Hungarian language course, students must sit for 2 written language tests and a short minimal oral exam.
A further minimum requirement is the knowledge of 200 words per semester announced on the first week. There is a (written or oral) word quiz in the first 5-10 minutes of the class, every week. If a

student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam that includes all 200 words along with the oral exam. The results of word quizzes can modify the end-semester evaluation.
The oral exam consists of a role-play randomly chosen from a list of situations announced in the beginning of the course. Failing the oral exam results in failing the whole course. The result of the oral exam is added to the average of the mid-term and end-term tests.

Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60, the student once can take an oral remedial exam covering the whole semester's material.

Consultation classes
In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.

Course book: Marschalkó, Gabriella: Hungarolingua Basic Level 1.

Website: Oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

CHAPTER 13
ACADEMIC PROGRAM FOR THE SHORT BASIC MEDICINE COURSE

Intensive Basic Medicine Course (Intensive BMC, Premedical Studies)
Duration of studies: 1 semester

The six-month intensive premedical Basic Medicine Course is recommended to those students who do not have thorough knowledge in Biology, Physics and Chemistry from high school. The requirements of these condensed premedical science subjects are very rigorous, thus preparation prior to the beginning the General Medicine, Dentistry or Pharmacy Program is recommended. Students successfully completing the course are directly admitted to their chosen program. The Intensive Basic Medicine Course starts in January.

Class Behavior

Students should not use cell phones to talk or text during class. Cell phones must be switched off or kept in silence mode during class. In seminars, students will be expected to participate in seminar discussions. Students are encouraged to ask questions related to the topic of the lectures discussed, and participate in solving problems related to the topic of the seminar. Some professors will ask for students to volunteer information, but some professors call on students randomly. It is, thus, a good idea to come to class prepared so as not to be embarrassed in front of the class. Students should not disrupt the class by talking to each other. If one continues to disrupt the class, the student may be asked to leave. The usage of electronic devices, textbooks and any form of interaction between students during the tests is strictly forbidden. Electronic devices (cell phones, tablets, dictionaries, etc.), except for approved simple calculators, must not be within the reach (in pocket, in the desk, etc.) of students during tests. It is the students' responsibility to stow these items before the test begins without specific warning by the supervising teachers. Violation of these above mentioned regulations results in an immediate and unconditional dismissal from the program.

Requirements

The course consists of lectures and seminars. Attending lectures is strongly recommended, attendance of seminars is compulsory and recorded. Everyone must attend the seminars with the group designated by the Registrar’s Office.

Absence can significantly affect your understanding and can have serious implications for progression in your studies. One might have a maximum of six seminar absences to have the opportunity to get exemption. Students missing 7-8 seminars cannot be exempted from the Final Examination (FE), regardless of their score reached on the Self Control Tests. Students omitting 9 or more seminars are dismissed from the course. Missed seminars cannot be made up unless one obtains prior permission to be absent.

The knowledge of the students will be tested 6 times during the entire course using a written test system by **Self Control Tests (SCT).** The course ends with a **Final Exam (FE)** from the whole material of the course and a minimum of four FE dates will be set during the summer examination period. Unsuccessful students may repeat the FE twice (B and C chances, and the latter ends up with an oral examination part). Exam exemption and bonus point policy are used to improve the students’ performance on SCTs. Exact details of these policies will be described below.

Exemption from FE is offered for students who achieve excellent academic performance during their studies under the following circumstances:
- the average score of the five best SCTs (out of 6) is at least 55%, AND
- passed all the SCTs with at least 30%, AND

- (s)he has a maximum of 6 seminar absences for a given subject.

Bonus points will be added to the FE score of eligible students and calculated as follows:

The average of the best 5 SCTs	Bonus points
51	1
52	3
53	5
54	7

Students who could not meet the above described conditions for exemption must sit for the FE from the whole material of the course.
The participation shall be preceded by ID confirmation (i.e. student's card, passport or driving license) before all forms of tests. Self Control Tests, End of Semester Exams, and Final Exams will be assessed as follows.

Percentage (%)	Mark
0 - 49.99:	fail (1)
50.00 - 64.99:	pass (2)
65.00 - 74.99:	satisfactory (3)
75.00 - 84.99:	good (4)
85.00 - 100:	excellent (5)

Absence for any reason counts as 0%.

Course coordinator: Dr. Beáta Lontay, Department of Medical Chemistry

Subject: **INTRODUCTION TO BIOLOGY**
Year, Semester: Intensive Basic Medicine Course
Number of teaching hours:
Lecture: **96**
Seminar: **96**

1st **week:**
Lecture: The chemistry of life 1.
The chemistry of life 2.
Proteins, carbohydrates and lipids 1.
Proteins, carbohydrates and lipids 2.

2nd **week:**
Lecture: Proteins, carbohydrates and lipids 3.
Proteins, carbohydrates and lipids 4.

3rd **week:**
Lecture: Nucleic acids and the origin of life 1.
Nucleic acids and the origin of life 2.
Cells: the working units of life 1.
Cells: the working units of life 2.

4th **week:**
Lecture: Cells: the working units of life 3.
Cells: the working units of life 4.
Cell membranes 1.
Cell membranes 2.

5th **week:**
Lecture: Cell membranes 3.
Cell membranes 4.
Energy, enzymes and metabolism 1.
Energy, enzymes and metabolism 2.

Self Control Test

6th **week:**
Lecture: Pathways that harvest chemical energy 1.
Pathways that harvest chemical energy 2.
Pathways that harvest chemical energy 3.
The cell cycle and cell division 1.

7th **week:**
Lecture: The cell cycle and cell division 2.
The cell cycle and cell division 3.
Inheritance, genes and chromosomes 1.
Inheritance, genes and chromosomes 2.

8th **week:**
Lecture: Inheritance, genes and chromosomes 3.
Inheritance, genes and chromosomes 4.
DNA and its role in heredity 1.
DNA and its role in heredity 2.
Self Control Test

9th **week:**
Lecture: DNA and its role in heredity 3.
DNA and its role in heredity 4.
From DNA to protein: gene expression 1.
From DNA to protein: gene expression 2.

10th **week:**
Lecture: From DNA to protein: gene expression 3.
From DNA to protein: gene expression 4.
Regulation of gene expression 1.
Regulation of gene expression 2.

11th **week:**
Lecture: Gene mutation and molecular medicine 1.
Gene mutation and molecular medicine 2.
Gene mutation and molecular medicine 3.
Gene mutation and molecular medicine 4.

12th **week:**
Lecture: The cellular signaling and communication 1.
The cellular signaling and communication 2.
The mechanism of evolution 1.
The mechanism of evolution 2.

13th **week:**
Lecture: Fungi: recyclers, pathogens, parasites 1.
Fungi: recyclers, pathogens, parasites 2.
Differential gene expression in development 1.
Differential gene expression in development 2.
Self Control Test

14th **week:**
Lecture: Tissues, organs and organ systems

15th **week:**
Lecture: Physiology, Homeostasis and Temperature Regulation
Blood, a fluid tissue.

16th **week:**
Lecture: Circulatory systems
The human circulatory system.

17th **week:**
Lecture: The human circulatory system.
Immunology: gene expression and natural defenses.
Self Control Test

18th **week:**
Lecture: Immunology: gene expression and natural defenses.
Nutrition, Digestion and Absorption.

19th **week:**
Lecture: Energy balance, vitamins and minerals
Gas exchange in Animals.

20th **week:**
Lecture: Salt and Water Balance Nitrogen Excretion.
Hormones
21st **week:**
Lecture: Neurons and Nervous system.
Self Control Test

22nd **week:**

Lecture: Neurons and Nervous system.
Sensory systems

23^{rd} **week:**
Lecture: Effectors: How animals get things done.

24^{th} **week:**
Lecture: Animal reproduction and Animal Development
The human reproduction system.
Self Control Test

Academic Advisors: Dr. András Penyige, Department of Human Genetics
Dr. Norbert Szentandrássy, Department of Physiology

Recommended book: Sadava, Hills, Heller, Berenbaum: Life (10^{th} edition)

Subject: **INTRODUCTION TO BIOPHYSICS**
Year, Semester: Intensive Basic Medicine Course
Number of teaching hours:
Lecture: **96**
Seminar: **144**

1^{st} **week:**
Lecture: 1-2. Introduction to modern physics. Standard of lengths, mass, time. Conversion of units. Useful mathematics. Trigonometry. Motion in one dimension, displacement, velocity, acceleration, motion diagrams.

2^{nd} **week:**
Lecture: 3-4. Freely falling objects. Vectors and their properties. Components of vectors. Displacement, velocity and acceleration in two dimensions. Motion in two dimensions. Relative velocity.

3^{rd} **week:**
Lecture: 5-6. The laws of motion. Newton's First, Second and Third Law. Application of Newton's Laws. Forces of friction.
Self Control Test

4^{th} **week:**
Lecture: 7-8. Energy. Work. Kinetic energy and the work-energy theorem. Gravitational potential energy.
Spring potential energy. System and energy conservation. Power. Work done by varying forces.

5^{th} **week:**
Lecture: 9-10. Momentum and impulse. Conservation of momentum.
Collisions. Elastic and inelastic collisions.

6^{th} **week:**
Lecture: 11-12. Angular speed and angular acceleration. Rotational motion under constant angular acceleration.
Centripetal acceleration. Newtonian gravitation. Kepler's laws.

7^{th} **week:**
Lecture: 13-14. Torque and the two conditions for equilibrium. The center of gravity.
Rotational kinetic energy. Angular momentum.
Self Control Test

8^{th} **week:**
Lecture: 15-16. States of matter. Deformation of solids. The Youngs’s, shear and bulk modulus.
Density and pressure. Variation of pressure with depth. Pressure measurements. Buoyant forces and Archimedes’s principle. Fluids in motion.

9^{th} **week:**
Lecture: 17-18. Temperature and the zeroth law of thermodynamics. Thermometers and

temperature scales. Thermal expansion of solids and fluids.
Macroscopic description of an ideal gas. The kinetic theory of gases.

10th **week:**
Lecture: 19-20. Energy in thermal processes. Heat and internal energy. Specific heat. Calorimetry. Latent heat and phase change.
The first law of thermodynamics.

11th **week:**
Lecture: 21-22. The second law of thermodynamics. Entropy. Refrigerators and heat pumps.. Elastic potential energy. Hook's law. Simple harmonic motion. Motion of a pendulum.
Self Control Test

12th **week:**
Lecture: 23-24.Waves. Frequency, amplitude and wavelength. Interference of waves. Reflection of waves. Sound. Energy and intensity of sound waves. Shock waves, standing waves.

13th **week:**
Lecture: 25. Doppler effect. The ear and the principles of hearing.

14th **week:**
Lecture: 26-27. Properties of electric charges. Insulators and conductors.
Coulomb's law.
Electric field. Electric field lines. Electric flux and Gauss's law.

15th **week:**
Lecture: 28-29. Electrical energy and capacitance.
The parallel plate capacitor. Combinations of capacitors. Energy stored in capacitors.
Capacitors with dielectric.
Self Control Test

16th **week:**
Lecture: 30-31. Electric current. Current and voltage measurements in circuits. Resistance and Ohm's law.
Resistivity, temperature variation of resistance. Semiconductors and superconductors. Electrical activity of the heart. Defibrillators.

17th **week:**
Lecture: 32-33.Direct current circuits.
Resistors in parallel and series.
Kirchhoff's rules and complex DC circuits.
RC circuits. Conduction of electrical signals by neurons.

18th **week:**
Lecture: 34-35. Magnetism. Magnetic field. Earth's magnetic field. Magnetic force on current carrying conductors. Torque on a current loop and electric motors.
Magnetic field of a long straight wire and Ampere's law. Magnetic field between two parallel conductors. Magnetic field of loops and solenoids.
Self Control Test

19th **week:**
Lecture: 36-37. Induced emf and magnetic flux. Faraday's law of induction. Motional emf. Lenz's law.
Generators. Self-inductance RL circuits.

20th **week:**
Lecture: 38-39. Alternating current.
Resistors, capacitors and inductors in AC circuits.
The transformer. Properties of electromagnetic waves. The spectrum of electromagnetic waves.

21st **week:**
Lecture: 40.The nature of light. Reflection, refraction and dispersion.
Prisms. The rainbow. Huygen's principle.
Total internal reflection and its medical applications.
Self Control Test

22nd **week:**
Lecture: 42-43. Lenses and mirrors. Flat mirrors. Images formed by spherical mirrors. Thin lenses. Images formed by lenses. Lens

aberrations.

23rd week:
Lecture: 44-45. Wave optics. Conditions for interference, polarization of light. Diffraction.

The camera, the simple magnifier, the compound microscope, the telescope and the eye.

24th week:
Lecture: 46-47. Some properties of the nuclei. Binding energy. Radioactivity, the decay processes. Medical application of radioactivity.
Nuclear reactions. Nuclear fission and fusion. Positron and other antiparticles. Mesons and quarks.

Academic Advisor: Dr. Attila Jenei, Department of Biophysics and Cell Biology

Recommended book: Serway, Vuille: College Physics (9th edition)

Subject: **INTRODUCTION TO MEDICAL CHEMISTRY**
Year, Semester: Intensive Basic Medicine Course
Number of teaching hours:
Lecture: **96**
Seminar: **96**

1st week:
Lecture: 1-2. Introduction to general chemistry. Elements. Symbols for the elements. The SI system of measurement. Atoms. The structure of atoms. Nuclear arithmetic. Molecules and ions, compounds and mixtures.

2nd week:
Lecture: 3-4. Chemical formulas. Naming chemical compounds. Chemical equations. Avogadro’s number and the mole. Atomic, molecular and molar mass relationships. Stoichiometry: chemical arithmetic. Yields of chemical reactions. Empirical and molecular formulas.

3rd week:
Lecture: 5-6. Light and the electromagnetic spectrum. Atomic spectra. The Bohr model of the hydrogen atom. The quantum mechanical model of the atom. Orbitals and quantum numbers. Electron configurations and the periodic table. Classification of the elements. Representative and transition elements.

4th week:
Lecture: 7-8. The sizes of atoms and ions. Ionization energy, electron affinity.
Self Control Test (1st SCT)

5th week:
Lecture: 9-10. Chemical bonds: metallic, ionic and covalent bonds. Electron-dot structures for molecular compounds and polyatomic ions. Single and multiple covalent bonds. Molecular shapes: the VSEPR model. Valence bond theory. Hybridization.

6th week:
Lecture: 11-12. Intermolecular forces. The gaseous state. Gases and gas pressure. The gas laws. The ideal gas law. Stoichiometric relationships with gases. Kinetic - molecular theory of gases.

7th week:
Lecture: 13-14. Liquid and solid states. Phase changes. Evaporation, vapor pressure, boiling point. Solutions and their properties. Concentration of solutions. Units of concentration: molarity, mass percent, molality. Dilution of solutions. Some factors affecting solubility.

8th **week:**
Lecture: 15-16. The chemistry of water. Ions in aqueous solution: electrolytes and nonelectrolytes. Reactions in aqueous solution. Discussion of general chemistry 1.

9th **week:**
Lecture: 17-18. Chemical equilibrium. The equilibrium constant. Factors that alter the composition of an equilibrium mixture. Self Control Test (2nd SCT)

10th **week:**
Lecture: 19-20. Acids and bases. The pH in solutions of strong acids and strong bases. Equilibria in solutions of weak acids. Equilibria in solutions of weak bases.

11th **week:**
Lecture: 21-22. Thermochemistry. Energy changes and energy conservation. Internal energy and state functions. Expansion work. Energy and enthalpy. The thermodynamic standard state. Enthalpies of physical and chemical changes. Hess's law. Oxidation and reduction. Oxidation state. The activity series of the elements. Balancing redox reactions. Galvanic cells.

12th **week:**
Lecture: 23-24. Discussion of general chemistry 2. Self Control Test (3rd SCT)

13th **week:**
Lecture: 25-26. Introduction to organic chemistry. Saturated hydrocarbons: alkanes.

14th **week:**
Lecture: 27-28. Cycloalkanes. Unsaturated hydrocarbons: alkenes and alkynes.

15th **week:**
Lecture: 29-30. Aromatic compounds: the structure and properties of benzene. The reactions of benzene. Heteroaromatic compounds.

16th **week:**
Lecture: 31-32. Organic halogen compounds. Alcohols and phenols.

17th **week:**
Lecture: 33-34. Ethers and organic sulfur compounds. Self Control Test (4th SCT)

18th **week:**
Lecture: 35-36. Aldehydes, ketones and quinones. Nitrogen containing organic compounds: the structure and properties of amines. Basicity and reactions of amines.

19th **week:**
Lecture: 37-38. Heterocyclic amines. Amines of biological importance. Discussion of Organic chemistry 1.

20th **week:**
Lecture: 39-40. Carboxylic acids: classification and nomenclature. Self Control Test (5th SCT)

21st **week:**
Lecture: 41-42. Properties of carboxylic acids. Reactions of carboxylic acids. Dicarboxylic acids. Unsaturated acids. Carboxylic acid derivatives: esters, fats, lactones, amides, lactams, thiol esters anhydrides, acyl chlorides.

22nd **week:**
Lecture: 43-44. Salts and detergents. Substituted carboxylic acids: halo acids, hydroxy acids, keto acids, amino acids. Stereochemistry. Types of isomerism.

23rd **week:**
Lecture: 45-46. Optical activity: properties of enantiomers and diastereomers. Discussion of Organic chemistry 2.

24th **week:**
Lecture: Self Control Test (6th SCT). Summary and discussion

Academic Advisor: Dr. Éva Bakó, Department of Medical Chemistry

Recommended books: McMurry, Fay: Chemistry (6^{th} edition)
Erdődi, Csortos: Organic chemistry for premedical students (2010)

CHAPTER 14
ACADEMIC PROGRAM FOR CREDIT SYSTEM

ACADEMIC PROGRAM FOR CREDIT SYSTEM

The introduction of the credit system became compulsory in every Hungarian university, including the University of Debrecen by September, 2003. The aim of the credit system is to ensure that the students' achievements can be properly and objectively evaluated both quantitatively and qualitatively.

A credit is a relative index of cumulative work invested in a compulsory, a required elective or a freely chosen subject listed in the curriculum. The credit value of a course is based upon the number of lectures, seminars and practical classes of the given subject that should be attended or participated in (so called "contact hours"), and upon the amount of work required for studying and preparing for the examination(s). Together with the credit(s) assigned to a particular subject (quantitative index), students are given grades (qualitative index) on passing an exam/course/class. The credit system that has been introduced in Hungary meets the standards of the European Credit Transfer System (ECTS). The introduction of the ECTS promotes student mobility, facilitates more effective organization of students' exchange programs aimed at further education in foreign institutions, and allows recognition of the students' work, studies and achievements completed in various foreign departments by the mother institution. Credit-based training is flexible. It provides a wider range of choice, enables the students to make progress at an individual pace, and it also offers students a chance to study the compulsory or required subjects at a different university, even abroad. Owing to the flexible credit accumulation system, the term "repetition of a year" does not make sense any longer. It should be noted, however, that students do not enjoy perfect freedom in the credit system either, as the system does not allow students to randomly include subjects in their curriculum or mix modules. Since knowledge is based on previous studies, it is imperative that the departments clearly and thoroughly lay down the requirements to be met before students start studying a subject.

The general principles of the credit system are the following:

1. Students can be given their degree if, having met other criteria as well, they have collected 300 credits during their studies. Considering the recommended curriculum, this can be achieved in five years.

2. According to the credit regulations, students should obtain an average of 30 credits in each semester.

3. The criterion of obtaining 1 credit is to spend 30 hours (including both contact and non-contact hours) studying the given subject.

4. Credit(s) can only be obtained if students pass the exam of the given subject.

5. Students accumulate the required amount of credits by passing exams on compulsory, required elective and freely chosen subjects. Completion of every single compulsory credit course is one of the essential prerequisites of getting a degree. Courses belonging to the required elective courses are closely related to the basic subjects, but the information provided here is more detailed, and includes material not dealt with in the frame of the compulsory courses. Students do not need to

take all required elective courses, but they should select some of them wisely to accumulate the predetermined amount of credits from this pool. Finally, a certain amount of credits should be obtained by selecting from the freely chosen courses, which are usually not related to the basic (and thus mandatory) subjects, but they offer a different type of knowledge.

6. 80, 15 and 5 percent of the total of 300 credits should be accumulated by completing the compulsory, required elective and freely chosen courses, respectively.

7. According to the qualification requirements, professional (compulsory and required elective) courses fall into three modules. The basic module provides the theoretical basis of medicine, and ensures that the necessary practical skills are developed. The preclinical module lays down the foundations of clinical knowledge, while in the clinical module the students are taught clinical medicine, and they attend practical classes to ensure proper command of the medical procedures. The credits accumulated in the different modules for compulsory and required courses should show the following distribution: basic module: 110-116, preclinical module: 50-58, and clinical module: 150-170 credits.

8. The pilot curricula show the recommended pacing of compulsory courses. If these courses are carefully supplemented with credits obtained from the necessary number of required elective and freely chosen courses, students can successfully accumulate the credits required for their degree within 10 semesters.

9. In the case of two-semester subjects, when students have to pass a final exam, they get higher credits in the semester of the final examination since preparation for a final examination takes up more non-contact hours from the students' time.

10. There are 13 compulsory final examinations in the curriculum; therefore one final exam is worth at least 10 credits.

11. The diploma work is worth 10 credits.

12. Regulations concerning the training of students in the credit system prescribe a minimum amount of credits for certain periods as outlined in the Rules and Regulations for English Program Students.

13. Although Physical Education and Summer Internship are not recognized by credits, they have to be completed to get the final degree (see the rules outlined in the Information section about the conditions).

14. Evaluation of the students' achievements needed for grants or applications is described in Rules and Regulations for English Program Students.

15. Further information is available in the Rules and Regulations for English Program Students.

We very much hope that the system of training will contribute to the successful completion of your studies.

We wish you good luck with your university studies.

This model curriculum applies to those who started their studies on Pharmacy Program in the academic year 2016-17.

Fort he previous years' curriculum please visit the university website: www.edu.unideb.hu

Compulsory courses for the 1. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	General Chemistry Practice	GYAKE04P1		15	60	AW5	3	None
1	General Chemistry Theory	GYAKE03P1	45			ESE	3	None
1	Hungarian Crash Course	AOG261008			36	AW5	0	None
1	Hungarian Language I/1.	GYHUN01P1			24	AW5	2	Hungarian Crash Course
1	Latin Language I.	GYLAT03P1			30	AW5	1	None
1	Mathematics	GYMAT03P1	30		30	ESE	5	None
1	Pharmaceutical Biology I.	GYBIO03P1	21		30	ESE	6	None
1	Pharmacy Propedeutics	GYPPO02P1	15			ESE	2	None
1	Physics	GYFIZ02P1	15		30	ESE	5	None

Compulsory courses for the 1. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Biophysics	GYBIF06P2	15	13	16	ESE	4	Mathematics, Physics
2	Hungarian Language I/2.	GYHUN04P2			30	AW5	2	Hungarian Language I/1.
2	Inorganic and Qualitative Analytical Chemistry Practice	GYSZK04P2		15	75	AW5	3	General Chemistry Theory, General Chemistry Practice
2	Inorganic and Qualitative Analytical Chemistry Theory	GYSZK03P2	45			ESE	3	General Chemistry Theory, General Chemistry Practice
2	Latin Language II.	GYLAT04P2			30	AW5	1	Latin Language I.
2	Organic Chemistry Practice I.	GYKSZ04P2		14	42	AW5	3	General Chemistry Theory, General Chemistry Practice
2	Organic Chemistry Theory I.	GYKSZ03P2	60			ESE	3	General Chemistry Theory, General Chemistry Practice
2	Pharmaceutical Anatomy	GYANA02P2	45		30	ESE	3	Pharmaceutical Biology I.
2	Pharmaceutical Biology II.	GYBIO04P2	35		30	FE	4	Pharmaceutical Biology I.
2	Physical Chemistry I.	GYFKE03P2	30	15		ESE	4	Mathematics, Physics, General Chemistry Theory and Practice

Compulsory courses for the 2. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Botany Practice	GYGYN04P3			30	AW5	1	Pharmaceutical Biology I.
1	Botany Theory	GYGYN03P3	30			ESE	2	Pharmaceutical Biology I.
1	Colloid and Surface Chemistry Practice	GYKOLL04P3			28	AW5	1	Physical Chemistry I.
1	Colloid and Surface Chemistry Theory	GYKOLL03P3	28			ESE	2	Physical Chemistry I.
1	Human Physiology I.	GYHEL03P3	30	15		ESE	4	Pharmaceutical Anatomy, Pharmaceutical Biology I.
1	Hungarian Language II/1.	GYHUN02P3			30	AW5	2	Hungarian Language I./2.
1	Organic Chemistry Practice II.	GYKSZ08P3			60	AW5	3	Organic Chemistry Theory I., Organic Chemistry Practice I.
1	Organic Chemistry Theory II.	GYKSZ07P3	60			FE	4	Organic Chemistry Theory I., Organic Chemistry Practice I.
1	Pharmaceutical Biochemistry I.	GYBIK03P3	40		5	ESE	4	Biophysics, Organic Chemistry Theory I., Pharmaceutical Biology II.
1	Physical Chemistry II.	GYFKE04P3			45	AW5	2	Physical Chemistry I.
1	Quantitative Analytical Chemistry Theory I.	GYKVA04P3	45	15		ESE	4	Inorganic and Qualitative Analytical Chemistry Theory, Inorganic and Qualitative Analytical Chemistry Practice

Compulsory courses for the 2. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Human Physiology II.	GYHEL04P4	30	10	20	FE	6	Human Physiology I.
2	Hungarian Language II/2.	GYHUN05P4			30	AW5	2	Hungarian Language II/1.
2	Pharmaceutical Biochemistry II.	GYBIK04P4	40		5	FE	6	Pharmaceutical Biochemistry I.
2	Pharmaceutical Technology Theory I.	GYTEC09P4	30			ESE	2	Colloid and Surface Chemistry Theory and Practice, Physical Chemistry II.
2	Pharmaceutical Technology Practice I. (Prescription Writing I.)	GYTEC18P4			60	AW5	2	Colloid and Surface Chemistry Theory and Practice, Physical Chemistry II.
2	Pharmacognosy Practice I.	GYGND06P4			60	AW5	3	Botany Theory, Botany Practice, Organic Chemistry Theory II., Organic Chemistry Practice II.
2	Pharmacognosy Theory I.	GYGND05P4	30			ESE	2	Botany Theory, Botany Practice, Organic Chemistry Theory II., Organic Chemistry Practice II.
2	Public Pharmacy practice after 2nd year (Personnel and objective requirements of Pharmacy and Preparation of pharmaceutical dosage forms)	GY_NYGY_2ND YEAR			120	SIGN	0	has to be completed before the 3rd year
2	Quantitative Analytical Chemistry Practice II.	GYKVA06P4			75	AW5	3	Quantitative Analytical Chemistry Theory I.
2	Quantitative Analytical Chemistry Theory II.	GYKVA05P4	15			FE	3	Quantitative Analytical Chemistry Theory I.

Compulsory courses for the 3. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Clinical Biochemistry I.	GYKPA03P5	30		14	AW5	4	Pharmaceutical Biochemistry II, Human Physiology II.
1	Medical Hungarian I.	GYHUN03P5			30	AW5	2	Hungarian Language II/2.
1	Pharmaceutical Chemistry Practice I.	GYGKE06P5			30	AW5	2	Organic Chemistry Theory II., Organic Chemistry Practice II.
1	Pharmaceutical Chemistry Theory I.	GYGKE05P5	45			ESE	4	Organic Chemistry Theory II., Organic Chemistry Practice II.
1	Pharmaceutical Neurobiology	GYNEU02P5	39	16	10	ESE*	3	Human Physiology II., Pharmaceutical Biochemistry II.
1	Pharmaceutical Technology Practice II. (Industrial Practice I.)	GYTEC22P5			60	AW5	2	Pharmaceutical Technology Theory I.,Pharmaceutical Technology practice I. (Prescription Writing I.)
1	Pharmaceutical Technology Practice II. (Prescription Writing II.)	GYTEC20P5			60	AW5	2	Pharmaceutical Technology Theory I., Pharmaceutical Technology Practice I. (Prescription Writing I.)
1	Pharmaceutical Technology Theory II.	GYTEC11P5	30			ESE	3	Pharmaceutical Technology Theory I., Pharmaceutical Technology practice I. (Prescription Writing I.)
1	Pharmacognosy Practice II.	GYGND08P5			60	AW5	3	Pharmacognosy Theory I., Pharmacognosy Practice I.
1	Pharmacognosy Theory II.	GYGND07P5	30			FE	4	Pharmacognosy Theory I., Pharmacognosy Practice I.

Compulsory courses for the 3. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Clinical Biochemistry II.	GYKPA04P6	60	8	30	FE	8	Clinical Biochemistry I.
2	Immunology	GYIMM06P6	26	3	8	ESE*	4	Clinical Biochemistry I.
2	Medical Hungarian II.	GYHUN06P6			30	FE	2	Medical Hungarian I.
2	Pharmaceutical Chemistry Practice II.	GYGKE08P6			30	AW5	2	Pharmaceutical Chemistry Theory I., Pharmaceutical Chemistry Practice I.
2	Pharmaceutical Chemistry Theory II.	GYGKE07P6	60			FE	6	Pharmaceutical Chemistry Theory I., Pharmaceutical Chemistry Practice I.
2	Pharmaceutical Technology Practice III. (Industrial Practice II.)	GYTEC26P6			60	AW5	2	Pharmaceutical Techn. Theory II., Pharmaceutical Techn. Practice II. (Prescription Writing II.), Pharmaceutical Technology Practice II. (Industrial Practice I.)
2	Pharmaceutical Technology Practice III. (Prescription writing III.)	GYTEC24P6			60	AW5	2	Pharmaceutical Techn. Theory II., Pharmaceutical Techn. Practice II. (Industrial Practice I.), Pharmaceutical Technology Practice II. (Prescription Writing II.)
2	Pharmaceutical Technology Theory III.	GYTEC13P6	30			ESE	3	Pharmaceutical Technology Theory II., Pharmaceutical Techn. Practice II., Prescription Writing II., Pharmaceutical Techn. Practice II. (Industrial Practice I.)
2	Public Pharmacy practice after 3rd year (Preparation of pharmaceutical dosage forms, management-quality assurance, dispensing, pharmaceutical business administ)	GY_NYGY_3RD YEAR			120	SIGN	0	has to be completed before the 4th year

Compulsory courses for the 4. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Medical Microbiology I.	GYMIK09P7	30	10	10	ESE	5	Immunology, Clinical Biochemistry II.
1	Pharmaceutical and Bioanalytical Chemistry I.	GYGMB09P7	30	15		ESE	4	Quantitative Analytical Chemistry Theory and Practice II., Pharmaceutical Chemistry Theory II.
1	Pharmaceutical bioanalytics and biotechnology I.	GYBTEC02P7	30			ESE	5	Quantitative Analytical Chemistry Theory and Practice II.,Pharmaceutical Chemistry Theory II.
1	Pharmaceutical Technology practice IV. (Industrial practice III.)	GYTEC28P7			45	AW5	2	Pharmaceutical Technology Theory III., Pharm. Techn. Pract. III. (Prescription Writing III.), Pharm. Techn. Pract. III. (Industrial practice II.)
1	Pharmaceutical Technology Theory IV.	GYTEC15P7	30			FE	3	Pharmaceutical Technology Theory III., Pharm. Techn. Pract. III. (Prescription Writing III.), Pharm. Techn. Pract. III. (Industrial practice II.)
1	Pharmacology Practice I.	GYHAT05P7			60	AW5	2	Pharmaceutical Chemistry Theory and Practice II., Pharmacognosy Theory and Practice II., Clinical Biochemistry II.
1	Pharmacology Theory I.	GYHAT04P7	60			ESE	4	Pharmaceutical Chemistry Theory and Practice II., Pharmacognosy Theory and Practice II., Clinical Biochemistry II.
1	Preventive Medicine and Public Health	GYMEG10P7	30	22	8	ESE	3	Immunology, Clinical Biochemistry II.

Compulsory courses for the 4. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Bioethics	GYETI06P8	30			ESE	1	Pharmaceutical Technology Theory IV., Pharmaceutical Technology Practice IV. (Industrial Practice III.)
2	Clinical Basics	GYKLI04P8	65	30		ESE*	3	Preventive Medicine and Public Health
2	Industrial Pharmaceutical Technology	GYIPGY01P8	30	15		ESE	2	Pharmaceutical Technology Theory IV., Pharmaceutical Technology Practice IV. (Industrial Practice III.)
2	Medical Microbiology II.	GYMIK09P8	15	15		FE	5	Medical Microbiology I.
2	Pharmaceutical and Bioanalytical Chemistry II.	GYGMB10P8	30		60	FE	6	Pharmaceutical and Bioanalytical Chemistry I.
2	Pharmaceutical Bioanalytics and Biotechnology II.	GYBTEC04P8	30		60	FE	5	Pharmaceutical Bioanalytics and Biotechnology I.,Pharmaceutical and Bioanalytical Chemistry I.
2	Pharmaceutical Management and Organisation	GYMAN02P8	30			ESE	2	Pharmaceutical Technology Theory IV., Pharmaceutical Technology Practice IV. (Industrial Practice III.)
2	Pharmacology Practice II.	GYHAT08P8			60	AW5	3	Pharmacology Theory I. and Pharmacology Practice I.
2	Pharmacology Theory II.	GYHAT06P8	60			FE	3	Pharmacology Theory I. and Pharmacology Practice I.

Compulsory courses for the 5. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Biopharmacy	GYBFA02P9	30		30	ESE*	6	Med. Microbiology II., Pharmacology Theory II. and Pharmacology Practice II., Pharm. Techn. Theory IV. and Pharm. Techn. Practice IV. (Indust. Practice III.)
1	Clinical Pharmacology	GYKFA04P9	30			ESE*	2	Pharmacology Theory II. and Pharmacology Practice II.
1	Clinical Pharmacy	GYKGY02P8	30		30	ESE*	4	Preventive Medicine and Public Health
1	Drug Interactions Theory	GYINT02P9	30			ESE	4	Pharmaceutical Techn. Theory IV., Pharmaceutical Techn. Practice IV. (Industrial Practice III.), Medical Microbiology II.
1	Pharmaceutical Care	GYGYG02P9	30			ESE	3	Pharmacology Theory II. and Pharmacology Practice II., Pharmaceutical Techn. Theory IV. and Pharmaceutical Techn. Practice IV. (Industrial Practice III.)
1	Pharmaceutical Communication Skills	GYGKO02P9	15	5		ESE	2	Pharmaceutical Technology Theory IV., Pharmacology Theory II. and Pharmacology Practice II.
1	Pharmaceutical Psychology	GYPSY04P9	30			ESE	2	Clinical Basics, Bioethics
1	Quality Control	GYMIN02P9	30			ESE	2	Pharmaceutical Techn. Theory IV. and Pharmaceutical Techn. Practice IV. (Industrial Practice III.), Pharmaceutical Management and Organization
1	Radiopharmacy Practice	GYRAD04P9			18	AW5	1	Pharmaceutical Technology Theory IV. and Pharmaceutical Technology Practice IV. (Industrial Practice III.)
1	Radiopharmacy Theory	GYRAD03P9	15			ESE	1	Pharmaceutical Technology Theory IV.

								and Pharmaceutical Technology Practice IV. (Industrial Practice III.)

Required elective courses for the 1. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Computer Science	GYINF48P1			30	AW5	3	None
1	Library System	GYKON41P1			10	AW5	1	None

Required elective courses for the 1. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	First Aid and Reanimation	GYELS42P2	7		8	AW5	2	None

Required elective courses for the 2. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Introduction to Scientific Research	GYTKU42P3	15			ESE	2	None

Required elective courses for the 2. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Modern biophysical methods in biology and medicine	AOMOD42T4	24			AW5	2	Biophysics
2	Modern Techniques Allowing the Investigation of Physiological Phenomena	AOKOR42T4	24			AW5	2	Human Physiology I.
2	Problem Based Learning in Physiology	AOPEL42T4			30	AW5	3	Human Physiology I.
2	The Regulatory Role of the Cell Membrane in Physiological and Pathological Conditions	AOSEM42T4	20			AW5	2	Human Physiology I.

Required elective courses for the 3. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Illicit drugs	GYKAB42P7	15			ESE	1	Organic Chemistry Theory I.
1	Introduction to Financial Management for Pharmacists	GYGAZD42P5	12		5	ESE	2	Pharmaceutical Technology Theory II.
1	Molecular Mechanism of Diseases Concerning Great Populations	AOG167605	25			AW5	2	Pharmaceutical Biochemistry II.

Required elective courses for the 3. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Chemical Biology	GYKEB42P8	15			ESE	1	Organic Chemistry Theory II.
2	Introduction to Pharmacoeconomy and - epidemiology	GYEKO42P6	10	2		ESE	2	Pharmaceutical Technology Theory II.
2	Pharmaceutical Excipients	GYSEA42G6	15			AW5	1	Pharmaceutical Techn. Theory II., Pharmaceutical Techn. Practice II. (Prescription Writing II.), Pharmaceutical Techn. Practice II.(Industrial Practice I.)

Required elective courses for the 4. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Biocosmetics	GYBKO42P8	15			ESE	1	Pharmaceutical Technology Theory III.
1	Environmental Analytical Chemistry	GYKOR02P8	45			AW5	3	Quantitative Analytical Chemistry Theory II., Quantitative Analytical Chemistry Practice II., Pharmaceutical Chemistry Theory II., Pharm. Chemistry Practice II.
1	Nanopharmaceutics	GYNANO42P8	15			ESE	1	Pharmaceutical Technology Theory III

Required elective courses for the 4. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	Basic Knowledge of Surgical Biomaterials for Students of Pharmacy	GYSEE02P8	8	16	8	AW5	3	Pharmaceutical Technology Theory I., Human Physiology II.
2	Dietary supplements and general nutrients	GYEKI42P8	30			ESE	2	Pharmacology Theory I., Pharmacology Practice I.
2	Pharmaceutical Computer Administration	GYADM42G8	30			AW5	1	Pharmaceutical Techn. Theory II., Pharmaceutical Techn. Practice II. (Prescription Writing II.), Pharmaceutical Technology Practice II. (Industrial Practice I.)
2	Pharmacovigilance	GYFAV42P8	15			ESE	1	Pharmaceutical Chemistry Theory II.
2	Polymorphism of Pharmaceuticals	GYGPO208	30			ESE	2	Pharmaceutical Techn. Theory II. and Pharmaceutical Techn. Practice II. (Prescription Writing II.), Pharmaceutical Technology Practice II. (Industrial Practice I.

Required elective courses for the 5. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
1	Galenic Preparations	GYKOU04P9	30			ESE	2	Pharmaceutical Technology Theory IV.
1	Juristic Knowledge for Pharmacists	GYJOG42P9	14			ESE	1	Pharmaceutical Management and Organisation
1	Operating System of the Pharmaceutical Industry	GYGMR42P9	15			ESE	1	Pharmaceutical Techn. Theory IV. and Pharmaceutical Techn. Practice IV. (Industrial Practice III.)
1	Phytopharmacology	GYFFA42P9	24			AW5	1	Pharmacology Theory II. and Pharmacology Practice II., Pharmacognosy Theory II. and Pharmacognosy Practice II.
1	Special Training Course - Clinical Pharmacology	GYSZI43P9	60			AW5	6	Clinical Pharmacology, Pharmacology Theory II. and Pharmacology Practice II.
1	Special Training Course - Industrial Pharmaceutical Technology	GYSZI44P9	60			AW5	6	Clinical Pharmacology, Pharmacology Theory II. and Pharmacology Practice II.
1	Special Training Course - Synthetic Chemical	GYSZI45P9	60			AW5	6	Clinical Pharmacology, Pharmacology Theory II. and Pharmacology Practice II.
1	Special Training Course - Toxicology	GYSZT42P9	60			AW5	6	Clinical Pharmacology, Pharmacology Theory II. and Pharmacology Practice II.
1	State Exam Practice I. Pharmacy dispensing	GYZVG42P9			120	AW3	3	None
1	State exam practice I. Prescription Pharmacy	GYZVG43P9			120	AW3	3	None
1	Thesis Consultation	GYDIP43P9				AW3	2	None
1	Veterinary Hygiene	GYAEU42P9	30			ESE	2	Pharmacology Theory II. and Pharmacology Practice II., Medical Microbiology II.

Required elective courses for the 5. year

Sem	Subjects	Neptun code	L	S	P	Exam	Crd	Prerequisites of taking the subject
2	State exam practice II. – Pharmaceutical management, Quality Assurance	GYZV48P10			60	AW3	2	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
2	State exam practice II. (Pharmaceutical business administration)	GYZVG50P10			60	AW3	1	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
2	State Exam Practice II. Institutional Pharmacy or Galenic Laboratory	GYZVG47P10			120	AW3	3	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
2	State Exam Practice II. Pharmacy Dispensing	GYZVG44P10			120	AW3	3	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
2	State Exam Practice II. Prescription Pharmacy	GYZVG45P10			120	AW3	3	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
2	Thesis	GYDIP44P10				AW5	8	Thesis Consultation

Freely Chosen Courses

Department	Subject	Neptun code	Crd	Sem	Hours	Exam	Prerequisites of taking the subject	Coordinator
Department of Anatomy, Histology and Embryology	Functional Anatomy of Brainstem	AOG107704 -K1	1	2	16	AW5	Pharmaceutical Anatomy	Klára Matesz M.D.,Ph.D.,D .Sc.
Department of Anatomy, Histology and Embryology	Selected Problems of the Neural Control: Modelling of Single Neurons and Neural Networks	AOG108504 -K1	1	2	12	AW5	Pharmaceutical Anatomy	Ervin Wolf M.Sc., Ph.D.
Department of Anatomy, Histology and Embryology	Nociceptive Sensory Information Processing at the Level of the Spinal Cord in Health and Disease	AOG1091A4	1	2	18	AW5	Pharmaceutical Anatomy	Miklós Antal M.D., Ph.D., D.Sc.
Department of Anatomy, Histology and Embryology	Functional Anatomy of the Visual System	AOG108204 -K1	1	2	16	AW5	Pharmaceutical Anatomy	Zoltán Kisvárday M.Sc., Ph.D., D.Sc.
Department of Anatomy, Histology and Embryology	Advanced Histology	AOG107803 -K8	1	1	16	AW5	Pharmaceutical Anatomy	Szabolcs Felszeghy Ph.D., D.D.S.
Department of Biochemistry and Molecular Biology	Biochemistry of Apoptosis	AOG167406	1	-	20	AW5	Pharmaceutical Biochemistry	Zsuzsa Szondy M.D., Ph.D., D.Sc.
Department of Biophysics and Cell Biology	Selected Topics in Cell Biology	AOG157403 -K1	1	-	16	AW5	Cell Biology	György Vereb M.D., Ph.D., D.Sc.
Department of Foreign Languages	Hungarian Language Elective General II.	AOG269102	2	2	30	AW5	Hungarian Crash Course	László Répás M.A.
Department of Foreign Languages	Hungarian Language Elective General I.	AOG268901	2	1	30	AW5	Hungarian Crash Course	László Répás M.A.
Department of Foreign Languages	Hungarian Language Elective - Medical I.	AOG26108A 1-K1	2	1	30	AW5	None	László Répás M.A.
Department of Foreign Languages	Hungarian Language Elective - Medical II.	AOG26108A 2-K1	2	2	30	AW5	Completion of Hungarian Language Elective Medical I.	László Répás M.A.

Department	Subject	Neptun code	Crd	Sem	Hours	Exam	Prerequisites of taking the subject	Coordinator
Department of Foreign Languages	Latin Medical Terminology	AOG2611002	1	2	30	AW5	Latin Language	László Répás M.A.
Department of Medical Microbiology	Interpretive Clinical Bacteriology and Virology	AOG428108	1	2	14	AW5	Medical Microbiology II.	József Kónya M.D., Ph.D.
Department of Medical Microbiology	Interesting Issues of Medical Parasitology	AOG429907	1	1	12	AW5	Medical Microbiology I.	Judit Szabó M.D., Ph.D.
Department of Medical Microbiology	Introduction to Medical Mycology	AOG4210207	1	1-2	14	AW5	Medical Microbiology II.	László Majoros M.D., Ph.D.
Department of Medical Microbiology	Clinical Mycology	AOG4210107	1	1-2	12	AW5	Medical Microbiology II.	László Majoros M.D., Ph.D.
Division of Clinical Laboratory Science	Platelet Function and Platelet Function Disorders	AOG632006	1	2	12	AW5	Clinical Biochemistry	
Institute of Behavioural Sciences, Faculty of Public Health	Inborn Sociality - Socialized Individuality: A New Concept	AOG358902-K8	2	-	30	AW5	None	Péter Molnár M.D., D.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Becoming a Doctor: Thematic Self-Awarness Group	AOG359005-K10	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Evolution and Medicine	AOG359101-K8	1	1	26	AW5	None	Péter Molnár M.D., D.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	The Basic Problems of Medicine	AOG358601	1	1	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Madness and Psychiatry (Philosophical Approach)	AOG359602	1	2	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Theory of Psychoanalysis and Its Influence on the Concept of Human Being in Medicine	AOG359501-K8	1	1	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.

Department	Subject	Neptun code	Crd	Sem	Hours	Exam	Prerequisites of taking the subject	Coordinator
Institute of Behavioural Sciences, Faculty of Public Health	Psychic Trauma	AOG351110 2-K1	1	2	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Theoretical and Methodological Questions of Patient Satisfaction Studies	AOG359308	1	2	15	AW5	None	Csilla Kemény M.A., Ph.D.
Institute of Behavioural Sciences, Faculty of Public Health	Yoga and Meditation I.	AOG351200 1-K1	1	1	30	AW5	None	Péter Molnár M.D., D.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Bioethical Cases	AOG358706	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Intercultural Health Care	AOG351160 5-K1	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Bioethics on Films	AOG351440 5	1	1	26	AW5	None	Péter Kakuk M.A., Ph.D.
Institute of Behavioural Sciences, Faculty of Public Health	Yoga and Meditation II.	AOG351040 1-K1	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Institute of Behavioural Sciences, Faculty of Public Health	Medicine in Art	AOG351500 3	0	1-2	20	AW5	None	Sándor Kőmüves M.A., Ph.D.
Institute of Behavioural Sciences, Faculty of Public Health	Issues about the Start and End of Life	AOG351510 3	1	1-2	22	AW5	None	Sándor Kőmüves M.A., Ph.D.

This model curriculum applies to those who started their studies on Pharmacy Program in the academic year 2016-17.

Fort he previous years' curriculum please visit the university website: www.edu.unideb.hu

CHAPTER 15
PUBLIC PHARMACY PRACTICES AND STATE EXAM PRACTICES

Public Pharmacy Practice after 2nd year

Syllabus of summer practice for second year pharmacy students

Duration of practice: 4 weeks, 8 hours per day, from which 2 hours may be spent preparing.
Second year students are required to gain proficiency in the following areas during their practice at a public pharmacy, and subsequently acquire knowledge about the conditions pertaining to personnel, equipment, supplies, operation, and workflow of a public pharmacy.

Main requirements for the student:
Before practice he/she should accept and sign the non-disclosure agreement.
Any absence from practice must be authentically justified based on the rules of the place of training. All absences must be made up.
He/she is expected to follow the directions of the pharmacist in charge of the training.

Skills expected from the student after the completion of practice:
- practical application of theoretical knowledge obtained during his / her studies
- he / she is expected to know the premises and the assets of the public pharmacy and be able to obtain information from manuals and scientific journals used during his / her work
- he / she is expected to learn about the working activities of a public pharmacy
- he / she is required to have an appropriate work relationship with the co-workers in the pharmacy

Student tasks during the practice:
Under the supervision of the pharmacist in charge of the training he / she will participate in the following activities:

1. Conditions pertaining to the personnel, equipment and supplies of the pharmacy:
- he / she is required to know the activities expected form the co-workers and the rules and regulations pertaining to them
- he / she is expected to know the rules of procedures
- he / she is expected to know the work protocol of the pharmacy
- he / she is required to be aware of rules and regulations pertaining to premises, equipment, supplies and assets
- he / she is expected to read pharmaceutical manuals and journals
- he / she is required to handle computer programs used in the pharmacy
- he / she is expected to become acquainted with authorities supervising work in pharmacies and representative bodies

2. Preparing medicine:
Acquiring knowledge about simple pharmaceutical technologies (measurement, mixing powders, dilution, calculating solution concentration and doses, and other simple calculations performed in pharmaceutical practice)
Learning magistral medicine preparation and its tools
Preparation of liquid medication under supervision, appropriate packaging, knowledge of the usage

Evaluation:
Keeping an electronic notebook: description of 1 syllabus-related practical issue in half / one page every two weeks
The pharmacist in charge of the training checks the work and description every second week and evaluates it using a five-point system. He /She sends the electronic notebook to the Dean's Office according to the rules of the place of training.
At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in a written form and grades the student based on a three-point system. He / she will send it to the Dean's Office in a printed and signed form according to the rules of the training place.

Student evaluation:
After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training place.

Public Pharmacy Practice after 3rd year

Syllabus for the practice in a public pharmacy after third year

Duration of practice: 4 weeks, 8 hours daily, from which 2 hours may be spent preparing individually
The student is required to gain proficiency in the following areas during his /her practice at a public pharmacy, and subsequently acquire knowledge about pharmacy operation including dispensing medication, preparing medication, validation and quality assurance, and the overall operation of the pharmacy.

Main requirements for the student:
Before practice he/she should accept and sign the non-disclosure document.
Absence from practice must be authentically justified based on the rules of the place of training. Absences must be made up.
He/she is expected to follow the guidance of the pharmacist in charge of the training.

Skills expected from the student after the completion of practice:
- practical application of the theoretical knowledge obtained during his / her studies
- he / she is expected to know the premises and the assets of the public pharmacy and be able to get information from manuals and scientific journals used during his / her work
- he / she is expected to learn about the work activities of a public pharmacy
- he / she is required to have an appropriate working relationship with the co-workers at the pharmacy
- he / she is expected to know the rules and regulations pertaining to the operation of pharmacies
- he/ she is required to explore the possibilities of communicating with patients

The student's tasks during the practice:
Under the supervision of the pharmacist in charge of the training he / she participates in the following activities:

1. Preparation of medicine. In the process he / she is required to learn:
How to prepare magistral / individual formulations according to the rules and to recognize

incompatibilities
The legal possibilities of changing the original prescription
The rules of labelling and their application (identifiability of manufacturer and patient, application, administration, shelf-life)
Documentation of preparation, and administrative obligations
Storage of materials, processing of basic formulations and subsequent administrative obligations
Formulations of the compendium and FoNo

2. Operation and quality assurance. In the process he / she is required to learn for the basic knowledgements:
- administrative work in the pharmacy
- standard procedures for workflow
- how to check and document workflow
- the rules pertaining to the examining and sampling incoming medications, documentation of examinations

3. Drug dispense. In the process he / she is required to learn for the basic knowledgements:
- how to check the content and layout of the prescription
- the database of nutrition complements and medicinal formula
- adequate application of the computer program. He / she is expected to get acquainted with the process and documentation of drug dispensing, and communication with patients
- the notion of pharmacy care and its practical ramifications

4. Medicine ordering. In the process he / she is required to learn for the basic knowledgements:
- how to order medicine
- about narcotics and activities involving their handling
- the rules pertaining to hazardous waste

Evaluation:
Keeping an electronic notebook: description of 1 syllabus-related practical problem in half / one page.
The pharmacist in charge of the training checks the work and description every second week and evaluates it using a five-grade system. He /She sends the electronic notebook to the Dean’s Office according to the rules of the place of training.
At the end of the practice the pharmacist in charge of the training evaluates the student’s overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean’s Office in a printed and signed form according to the rules of the training place.

Student evaluation:
After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

State Exam Practice II. Pharmaceutical Business Administration

1. Syllabus for the practice in a public pharmacy before final examination

Duration of the practice is 2+3 months, 8 hours daily, from which two hours may be spent on preparing individually.
Pharmacy students should gain experience on the following areas in a general pharmacy during their practice and subsequently acquire knowledge about pharmacy operation including: dispensing medication, preparing medication, validation and quality assurance, and the overall operation of the pharmacy.

Main requirements for the student:
He/she should accept and sign the non-disclosure document.
Absence from practice must be authentically justified based on the rules of the place of training. Absences must be made up.
He/she is expected to follow the guidance of the pharmacist in charge of the training.

The expected skills made on the student after completion of the practice:
- practical application of the theoretical knowledge obtained during his / her studies,
- the knowledge of the practical application of the rules and regulations concerning the operation of pharmacies,
- he / she is required to have an appropriate working relationship with the co-workers at the pharmacy
- he/ she is expected to communicate with the patients in an appropriate way,
- he / she is required to appropriately inform and give advice in connection with the patients' questions regarding self-healing and preparations without prescription (drugs and other products),
- He / she is required to identify „problematic patients" from the point of view of communication and to handle situations properly with help.

The student's tasks during the practice:
Under the supervision and instructions of the pharmacist in charge of the training he / she participates in the following activities:
1. Drug Dispense. In the process he / she is required to solve the following problems:
- how to check the content and layout of the prescription
- the application of the rules regarding the replacement of drugs, ordering of drugs on the basis of international non-proprietary name,
- appropriate patient information knowing the effects and adverse effects of drugs,
- recognition and evaluation of the characteristic interactions based on database (drug-drug, drug-food, drug-food supplement),
- characteristic/obligatory cases and methods of medical information and consultation,
- duties in connection with the known/identified adverse effects of drugs,
- adherence control and means of correction, common uses,
- the typical cases of self-healing, the dispensing of the preparations without prescription that can be applied for this purpose,
- the possibilities and rules of access to data regarding the patients' previous medication (OEP database),
- the database of nutrition complements and medicinal formulae
- proper application of the labelling and dispensing computer program.

2. Preparation of medicine. In the process he / she is required to solve the following problems:
- How to prepare magistral / individual formulations according to the rules and to recognize incompatibilities
- The legal possibilities of changing the original prescription
- The rules of labelling and their application (identifiability of manufacturer and patient, application, administration, shelf-life)
- Documentation of preparation, and administrative obligations
- Storage of materials, processing of basic formulations and subsequent administrative obligations
- Formulations of the compendium and FoNo

3. Operation, quality assurance. In the process he / she is required to solve the following problems:
- administrative work in the pharmacy
- the rules concerning the staff of the pharmacy; qualification, labor law requirements,
- standard procedures for workflow
- how to check and document workflow
- the rules pertaining to the examining and sampling incoming medications,
- documentation of examinations

4. Medication management. In the process he / she is required to solve the following problems:
- aspects of inventory management,
- how to order medicine
- duties in case of waste products, returned items, damage,
- withdrawal of products from circulation,
- duties regarding shift of prices,
- closings: daily, weekly, periodic as well as schedule of OEP reports,
- importance and practice of supervision of prescriptions,
- about narcotics and activities involving their handling,
- the rules pertaining to hazardous waste.

Evaluation:
Keeping an electronic workbook: the description of two practical problems in half/one page weekly. One of them should describe a question related to the patient (dispensing drugs), the other topic can be chosen from the three other areas (preparation of medicine, operation, medication management). The descriptions made during the practice should be concerned with all the areas of the activities at a pharmacy. The pharmacist in charge of the training checks the work and description every week and evaluates it using a five-grade system. He / She sends the electronic notebook to the Dean's Office according to the rules of the place of training.
The student is required to make a 10-15-minute-long presentation for the co-workers of the pharmacy from a professional scientific journal recommended by the pharmacist in charge of the training (the documentation of which will be kept in the workbook) on one occasion. The presentation will take place on a date agreed on by the training location and the student.
At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place.

After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

2. Syllabus for the practice in a hospital pharmacy before final examination

Duration of the practice is 1 month, 8 hours daily, from which two hours may be spent on preparing individually.
Pharmacy students should gain experience on the following areas in a hospital pharmacy during their practice regarding the characteristics of supplying medicine: system of in-patient care and medicines financing, medication management (acquisition and selling), preparation of individual and multi-dose medicine, therapeutic consultation, system of quality assurance.

Main requirements for the student:
He/she should accept and sign the non-disclosure document.
Absence from practice must be authentically justified based on the rules of the place of training.
Absences must be made up.

Skills expected from the student after the completion of practice:
- practical application of the theoretical knowledge obtained during his / her studies
- the knowledge of the practical application of the rules and regulations concerning the operation of pharmacies,
- appropriate communication with the co-workers at the pharmacy and the qualified and unqualified employees of the hospital,
- appropriate communication with the in-patients.

The student's tasks during the practice:
He/she is required to participate in the following activities settled down in the regulations regarding hospital pharmacies (41/2007 Eü M) under the supervision and instruction of the pharmacist in charge of the training:

1. Ordering medicines / storage / dispensing to departments. In the process he / she is required to learn:
- various ways of supplying medicines: „central procurement", private tenders, supplying medicines in addition to procurement,
- the IT system of medication management,
- the ways of fulfilling the medicine claims of the departments / patients,
- registry of controlled preparations,
- procedure of fulfilling the individual import and „off-label" claims.

2. Individual and multi-dose sterile and non-sterile preparation of medicine. In the process he / she is required to learn:
- the FoNo and manual drug making,
- cytotoxic preparations, preparation of mixture infusion,
- the possible solutions for individual needs.

3. Therapeutic consultant tasks. In the process he / she is required to learn:
- therapeutic protocols (the circle of medicines which can be selected primarily),
- the informational activity of the pharmacy; medicine-substitution, mistakes in connection with medication, side effects, monitoring, signaling, and reporting interactions.

4. Operation / quality assurance. In the process he / she is required to learn:
- the place of the pharmacy in the in-patient institutional hierarchy,
- the financing system of the in-patient care; HBCS, the place of the medicine in the HBCS,
- the planning and documentation of dispensing in the in-patient departments,
- the special techniques for subsidizing medication (itemized financing, individual equity, charities),
- the aim and management of establishing a list of basic medicines,
- the reason for medicine shortages and the handling of it,
- duties in connection with the medicines of clinical medicine trials,
- the participation of the pharmacy in hospital board meeting and work-groups (pharmacotherapeutic, nutritional, etc.),
- job descriptions, duties and competences,
- plans for further trainings, the system of pharmaceutical reporters and professional meetings.

Evaluation:
Keeping an electronic workbook: the description of two practical problems in a half/one page weekly. One of them should describe a therapeutic question in direct connection with the patient, the other topic can be chosen from the three other areas (supplying medicine, making of drugs, operation, making of drugs). The descriptions made during the practice should be concerned with all the areas of the activities in a pharmacy. The instructing pharmacist checks the work and description weekly and evaluates them on a scale of 5. He/she should send the electronic workbook to the Dean's Office in accordance with the rules of the training location.
The student is required to make a 10-15-minute-long presentation for the co-workers of the pharmacy from a professional scientific journal recommended by the pharmacist in charge of the training (the documentation of which will be kept in the workbook) on one occasion. The presentation will take place on a date agreed on by the training location and the student.
At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place.

Student evaluation:
After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

State Exam Practice II. Pharmaceutical Management, Quality Assurance

1. Syllabus for the practice in a public pharmacy before final examination

Duration of the practice is 2+3 months, 8 hours daily, from which two hours may be spent on preparing individually.
Pharmacy students should gain experience on the following areas in a general pharmacy during their practice and subsequently acquire knowledge about pharmacy operation including: dispensing medication, preparing medication, validation and quality assurance, and the overall operation of the pharmacy.

Requirements for the student:
Accept and sign the non-disclosure document.

Absence from practice must be authentically justified based on the rules of the place of training. Absences must be made up.
He/she is expected to follow the guidance of the pharmacist in charge of the training.

The expected skills made on the student after completion of the practice:
- practical application of the theoretical knowledge obtained during his / her studies,
- the knowledge of the practical application of the rules and regulations concerning the operation of pharmacies,
- he / she is required to have an appropriate working relationship with the co-workers at the pharmacy
- he/ she is expected to communicate with the patients in an appropriate way,
- he / she is required to appropriately inform and give advice in connection with the patients' questions regarding self-healing and preparations without prescription (drugs and other products),
- He / she is required to identify „problematic patients" from the point of view of communication and to handle situations properly with help.

The student's tasks during the practice:
Under the supervision and instructions of the pharmacist in charge of the training he / she participates in the following activities:

1. Drug Dispense. In the process he / she is required to learn:
- how to check the content and layout of the prescription
- the application of the rules regarding the replacement of drugs, ordering of drugs on the basis of international non-proprietary name,
- appropriate patient information knowing the effects and adverse effects of drugs,
- recognition and evaluation of the characteristic interactions based on database (drug-drug, drug-food, drug-food supplement),
- characteristic/obligatory cases and methods of medical information and consultation,
- duties in connection with the known/identified adverse effects of drugs,
- adherence control and means of correction, common uses,
- the typical cases of self-healing, the dispensing of the preparations without prescription that can be applied for this purpose,
- the possibilities and rules of access to data regarding the patients' previous medication (OEP database),
- the database of nutrition complements and medicinal formula
- proper application of the labelling and dispensing computer program.

2. Preparation of medicine. In the process he / she is required to learn:
- How to prepare magistral / individual formulations according to the rules and to recognize incompatibilities
- The legal possibilities of changing the original prescription
- The rules of labelling and their application (identifiability of manufacturer and patient, application, administration, shelf-life)
- Documentation of preparation, and administrative obligations
- Storage of materials, processing of basic formulations and subsequent administrative obligations
- Formulations of the compendium and FoNo

3. Operation, quality assurance. In the process he / she is required to learn:

- administrative work in the pharmacy
- the rules concerning the staff of the pharmacy; qualification, labor law requirements,
- standard procedures for workflow
- how to check and document workflow
- the rules pertaining to the examining and sampling incoming medications,
- documentation of examinations

4. Medication management. In the process he / she is required to learn:
- aspects of inventory management,
- how to order medicine
- duties in case of waste products, returned items, damage,
- withdrawal of products from circulation,
- duties regarding shift of prices,
- closings: daily, weekly, periodic as well as schedule of OEP reports,
- importance and practice of supervision of prescriptions,
- about narcotics and activities involving their handling,
- the rules pertaining to hazardous waste.

Evaluation:
Keeping an electronic workbook: the description of two practical problems in half/one page weekly. One of them should describe a question related to the patient (dispensing drugs), the other topic can be chosen from the three other areas (preparation of medicine, operation, medication management). The descriptions made during the practice should be concerned with all the areas of the activities at a pharmacy. The pharmacist in charge of the training checks the work and description every week and evaluates it using a five-grade system. He / She sends the electronic notebook to the Dean's Office according to the rules of the place of training.
The student is required to make a 10-15-minute-long presentation for the co-workers of the pharmacy from a professional scientific journal recommended by the pharmacist in charge of the training (the documentation of which will be kept in the workbook) on one occasion. The presentation will take place on a date agreed on by the training location and the student.
At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place.

Student evaluation:
After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

2. Syllabus for the practice in a hospital pharmacy before final examination

Duration of the practice is 1 month, 8 hours daily, from which two hours may be spent on preparing individually.
Pharmacy students should gain experience on the following areas in a hospital pharmacy during their practice regarding the characteristics of supplying medicine: system of in-patient care and medicines financing, medication management (acquisition and selling), preparation of individual and multi-dose medicine, therapeutic consultation, system of quality assurance.

Requirements for the student:
Accept and sign the non-disclosure document.
Absence from practice must be authentically justified based on the rules of the place of training. Absences must be made up.

Skills expected from the student after the completion of practice:
- practical application of the theoretical knowledge obtained during his / her studies
- the knowledge of the practical application of the rules and regulations concerning the operation of pharmacies,
- appropriate communication with the co-workers at the pharmacy and the qualified and unqualified employees of the hospital,
- appropriate communication with the in-patients.

The student's tasks during the practice:
He/she is required to participate in the following activities settled down in the regulations regarding hospital pharmacies (41/2007 Eü M) under the supervision and instruction of the pharmacist in charge of the training:

1. Ordering medicines / storage / dispensing to departments. In the process he / she is required to learn:
- various ways of supplying medicines: „central procurement", private tenders, supplying medicines in addition to procurement,
- the IT system of medication management,
- the ways of fulfilling the medicine claims of the departments / patients,
- registry of controlled preparations,
- procedure of fulfilling the individual import and „off-label" claims.

2. Individual and multi-dose sterile and non-sterile preparation of medicine. In the process he / she is required to learn:
- the FoNo and manual drug making,
- cytotoxic preparations, preparation of mixture infusion,
- the possible solutions for individual needs.

3. Therapeutic consultant tasks. In the process he / she is required to learn:
- therapeutic protocols (the circle of medicines which can be selected primarily),
- the informational activity of the pharmacy; medicine-substitution, mistakes in connection with medication, side effects, monitoring, signaling, and reporting interactions.

4. Operation / quality assurance. In the process he / she is required to learn:
- the place of the pharmacy in the in-patient institutional hierarchy,
- the financing system of the in-patient care; HBCS, the place of the medicine in the HBCS,
- the planning and documentation of dispensing in the in-patient departments,
- the special techniques for subsidizing medication (itemized financing, individual equity, charities),
- the aim and management of establishing a list of basic medicines,
- the reason for medicine shortages and the handling of it,
- duties in connection with the medicines of clinical medicine trials,
- the participation of the pharmacy in hospital board meeting and work-groups

(pharmacotherapeutic, nutritional, etc.),
- job descriptions, duties and competences,
- plans for further trainings, the system of pharmaceutical reporters and professional meetings.

Evaluation:
Keeping an electronic workbook: the description of two practical problems in a half/one page weekly. One of them should describe a therapeutic question in direct connection with the patient, the other topic can be chosen from the three other areas (supplying medicine, making of drugs, operation, making of drugs). The descriptions made during the practice should be concerned with all the areas of the activities in a pharmacy. The instructing pharmacist checks the work and description weekly and evaluates them on a scale of 5. He/she should send the electronic workbook to the Dean's Office in accordance with the rules of the training location.
The student is required to make a 10-15-minute-long presentation for the co-workers of the pharmacy from a professional scientific journal recommended by the pharmacist in charge of the training (the documentation of which will be kept in the workbook) on one occasion. The presentation will take place on a date agreed on by the training location and the student.
At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place.

Student evaluation:
After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

CHAPTER 16
ACADEMIC PROGRAM FOR THE 1ST YEAR

Department of Biophysics and Cell Biology

Subject: **MATHEMATICS**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Lecture: **30**
Practical: **30**

1st week:
Lecture: Introduction to mathematics: sets and classification of numbers. Order of operations, rounding numbers, scientific notation, direct and inverse proportionality, units and their conversions, prefixes. Linear and quadratic equations, equation systems. Vectors.
Seminar: Same as the lecture.

2nd week:
Lecture: Graphical representation of data, graphs of equations, elementary functions, analyzing graphs of functions, transformations and combination of functions, inverse function. Trigonometric functions and their transformations.
Seminar: Same as the lecture.

3rd week:
Lecture: Limits and their properties, continuity, some theorems on continuous functions
Seminar: Same as the lecture.

4th week:
Lecture: Sequence and series, investigation of convergence
Seminar: Same as the lecture.

5th week:
Lecture: Differentiation: the tangent line problem, some definitions of derivatives, basic differentiation rules
Seminar: Same as the lecture.

6th week:
Lecture: Differentiation part 2: The chain rule, derivatives of trigonometric functions, Implicit differentiation and higher derivatives
Seminar: Same as the lecture.

7th week:
Lecture: Differentiation part 3: Application of derivatives, analysis of functions
Seminar: Same as the lecture.

8th week:
Lecture: Integration, an area problem, definition of definite integral, some theorems on integral calculus, fundamental theorem of calculus
Seminar: Same as the lecture.

9th week:
Lecture: Area between graphs, more applications of integral calculus
Seminar: Same as the lecture.

10th week:
Lecture: Formal integration, indefinite integrals, integration by parts, trigonometric integrals
Seminar: Same as the lecture.

11th week:
Lecture: Integration by trigonometric substitution, partial fraction
Seminar: Same as the lecture.

12th week:
Lecture: Numerical integration, trapezoidal rule, Simpson's rule
Seminar: Same as the lecture.

13th week:
Lecture: Differential equations.
Seminar: Same as the lecture.

14th week:
Lecture: More applications of differential equations.
Seminar: Same as the lecture.

15th week:
Lecture: Application of differential equations in biochemistry, Michaelis-Menten equation of enzyme kinetics.
Seminar: Test.

Requirements

1. Lectures: Attendance to lectures is emphatically recommended. All material covered in the lectures is an integral part of the subject and therefore included in the self-control tests and the final exam. Some concepts and ideas are discussed in the lectures only and are not in the textbook. If a student is present on every lecture, he/she receives 10 bonus points (5 points for week 2-5 and 5 for week 8-15) which is added to the result of the final exam and/or the course test according to point 5. Attendance to the lectures will be checked randomly. No kind of certificate, including a medical certificate, is accepted for the absences.

2. Seminars: Attendance to seminars is compulsory, however a student may miss maximum 4 (four) seminars. The teacher will discuss the material of the lectures in more detail on seminars. In the seminars, students are encouraged to ask questions related to the topic of the lectures discussed.

3. Exemptions: Applications for exemption from the mathematics course has to be turned in to the Credit Transfer Committee. Such requests are not accepted by the Biomathematics Division or the Department of Biophysics and Cell Biology. The deadline for such applications is Friday on the third week. No application will be considered after this date.

4. Requirements for signing the lecture book: Maximum 4 absences are allowed from the seminars. If the number of absences from the seminars is more than four, we will not sign the lecture book.

5. Self-control tests (STC) and final exam (FE): Students will have two STCs during the semester. One on week 7 and the other one on week 13 whose structure will be identical to those of the final exam. None of the SCTs are obligatory. Each SCT will be graded (0-100 %, 0% for absence) and the results of the two SCTs will be averaged (Xave). The missed test will be counted as 0% in the average. Missed SCTs cannot be made up at a later time. Based on the SCTs students may obtain the following grades:

Xave percentage	Mark
0-59.99	FAIL(1)
60-69.99	PASS(2)
70-79.99	SATISFACTORY(3)
80-89.99	GOOD(4)
90-100	EXCELLENT(5)

Students who could not meet the above described conditions for exemption during the two semesters must sit for the FE from the whole material of the semester. Students have three chances (A, B, C) for passing the mathematics FE in the winter exam period after the semester in which the course was taken. On the FE students may obtain the following grades:

Percentage	Mark
0-49.99	FAIL(1)
50-64.99	PASS(2)
65-74.99	SATISFACTORY(3)
75-84.99	GOOD(4)
85-100	EXCELLENT(5)

6. Compulsory reading:
Belágyi, Mátyus, Nyitrai: Mathematics,
ISBN: 978-963-343-8 Yuen & Yuan: Calculus, Springer-Verlag Singapore Pte. Ltd. 2000, ISBN: 981-3083-8, 981-3083-2

7. Rules for calculator usage during course tests and the final examination
In order to ensure a fair evaluation, to avoid disturbances in the testing room, and to protect the security of the test material the following types of calculators are NOT permitted:
- Calculators with built-in computer algebra systems (capable of simplifying algebraic expressions)
- Pocket organizers, handheld or laptop computers
- Any device capable of storing text. Calculators with a typewriter keypad (so-called QWERTY devices), electronic writing pads and pen-input devices are not allowed either. Calculators with letters on the keys (e.g. for entering hexadecimal numbers or variable names) are permitted as long as the keys are not arranged in QWERTY format
- Calculators or other devices capable of communicating with other devices
- Calculators built into wireless phones
- Calculators with paper tape or models that make noise

In general, students may use any four-function, scientific or graphing calculator except as specified above. Sharing calculators during tests is not allowed, and the test proctor will not provide a calculator.

Department of Foreign Languages

Subject: **HUNGARIAN CRASH COURSE**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Practical: **36**

1st week:
Practical: 1st day: Introduction, The Hungarian alphabet, Vowel harmony. Ki vagy? Köszönések. Personal pronouns, Conjugation of the verb "lenni". 2nd day: Köszönések (Greetings). Magyar nevek, magyar családnevek. Számok (Numbers). Fontos telefonszámok, telefonszámok kiolvasása. 3rd day: Magyar pénz. How many? Ordinal numbers. Hogy vagy? Milyen nyelven beszélsz? Word formation with "-ul, -ül". 4th day: Mit csinálsz? Present tense verbal endings. Adverbs of time. Hová mész ma este? "Lenni" in past and future. Adverbs of place. 5th day: Mit kérsz? Te vs. ön/maga. Object of the sentence. Revision of previous topics.

2nd week:
Practical: 1st day: Kérsz egy kávét? Word formation. Plural marker. Tud/akar/szeret/szeretne gitározni. Infinitive. 2nd day: Milyen idő van ma? "-ik" group verbs. Irregular verbs in the present tense. Postán. Vasútállomáson. Mit eszünk ma este? Double negation. The negative of "van, vannak". 3rd day: Tetszik a ruhád. Possessive. Az emberi test.

Nekem van. 4th day: Milyen szeme van? Absence of "van, vannak". Comparison. Summary. Practice. 5th day: End course exam.

Oral minimal requirement exam.

Requirements

9.00 - 10.30: language classes
10.30 – 11:00: break
11.00 - 12.30: language classes

Assessment: five grade evaluation (AW5).

Evaluation: Based on a written final test (80 %) + class participation + daily word quizzes (20 %). Passing the oral exam is a minimal requirement for the successful completion of the Hungarian Crash Course. The oral exam consists of a role-play randomly chosen from 7 situations announced in the beginning of the course. Further minimal requirement is the knowledge of 200 words announced at the beginning of the course.

STUDENTS WHO DO NOT ATTEND THE HUNGARIAN CRASH COURSE DUE TO THEIR OWN FAULT OR FAIL THE ORAL EXAM HAVE TO TAKE AN EXTRA COURSE FOR AN ADDITIONAL FEE OF 500 USD DURING THE FIRST SEMESTER.

Subject: **HUNGARIAN LANGUAGE I/1.**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Practical: **24**

1st week:
Practical: Revision.

2nd week:
Practical: Pretest

3rd week:
Practical: Unit 1

4th week:
Practical: Unit 2

5th week:
Practical: Unit 2

6th week:
Practical: Unit 3

7th week:
Practical: Revision (Mid-term test)

8th week:
Practical: Unit 4

9th week:
Practical: Unit 5

10th week:
Practical: Unit 5

11th week:
Practical: Revision.

12th week:
Practical: End-Term test. Oral minimum exam.

Requirements

Attendance

Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the final signature is refused and the student must repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.

Testing, evaluation

In each Hungarian language course, students must sit for 2 written language tests and a short minimal oral exam.

A further minimum requirement is the knowledge of 200 words per semester announced on the first week. There is a (written or oral) word quiz in the first 5-10 minutes of the class, every week. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam that includes all 200 words along with the oral exam. The results of word quizzes are added to the average score of the written tests.

The oral exam consists of a role-play randomly chosen from a list of situations announced in the beginning of the course. Failing the oral exam results in failing the whole course. The result of the oral exam is added to the average of the mid-term and end-term tests.

Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60, the student once can take an oral remedial exam covering the whole semester's material.

Consultation classes: In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.

Course book: Győrffy, E.: Hogy s mint? I.

Website: Audio files to the course book, oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Subject: **LATIN LANGUAGE I.**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Introduction to Pharmaceutical Terminology Anatomical planes and directions.

2nd week:
Practical: Pharmaceutical substances, Chemistry terms

3rd week:
Practical: The human body; Greek and Latin equivalents

4th week:
Practical: Names of plants and plant parts; names of chemical compounds

5th week:
Practical: Parts of prescriptions, types of prescriptions in Hungary

6th week:
Practical: The human skeleton; numbers

7th week:
Practical: Pharmacy preparations and containers; 1st and 2nd declension

8th week:
Practical: Revision

9th week:
Practical: Regions; formation of adjectives

10th week:
Practical: Declension of adjectives with 3 endings; joints and bony connections

11th week:
Practical: Names of joints; declension of numbers

12th week:
Practical: 3rd declension; Declension of adjectives with 1 or 2 endings

13th week:
Practical: Summary of the declensions and adjectives

14th week:
Practical: Revision

15th week:
Practical: Closing of the semester, evaluation

Requirements

Requirements of the Latin language courses Attendance
Language class attendance is compulsory. The maximum ratio of allowable absences is 10 % which is a maximum of 2 out of the weekly classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the signature is refused and the student has to repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.

Testing, evaluation
In each language course, students have to sit for 2 written language tests.

Further minimum requirement is the knowledge of 300 words in each semester announced on the first week. Every week there is a (written or oral) word quiz from 30 words in the first 5-10 minutes of the class. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam from all the 300 words on the last week of the semester. The results of word quizzes can modify the evaluation at the end of the semester.
Based on the final score the grades are given according to the following table:

Final score	**Grade**
0 – 59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60, the student once can take a remedial exam covering the material of the whole semester.

Consultation classes
In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional for the students.

Coursebook: Takácsné Tóth Emőke: Latin for Pharmacy Students

Website: Minimum vocabulary lists and further details are available on the website of the Department of Foreign Languages: ilekt.med.unideb.hu

Department of Human Genetics

Subject: **PHARMACEUTICAL BIOLOGY I.**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Lecture: **21**
Practical: **30**

1st week:
Lecture: 1. Introduction into cell biology. The most important organic and inorganic compounds of the living cells. 2. Introduction into cell biology. Structural and functional characteristics of the bacterial cell.
Practical: 1. Introduction of the subject, methods of studying, compulsory and recommended literature. Getting acquainted, lab safety education. Microscopy I. Theoretical background, components of a microscope. Basics of electron microscopic techniques.

2nd week:
Lecture: 3. Molecular structure and function of biological membranes. 4. Transport across membranes. The eukaryotic and prokaryotic cell boundary.
Practical: 2. Microscopy II. The principles of phase contrast, dark field and polarization microscopy. Setting up the microscope. Practicing the use of light microscope.

3rd week:
Lecture: 5. The most important morphological and functional characteristics of fungal cell. The

biotechnological importance of fungi. 6. The plant cell and its most characteristic organelles.
Practical: 3. Chemical structure of proteins, nucleic acids, and carbohydrates and their biological significance.
Self Control Test (Test on Microscopy in extra time)

4th week:
Lecture: 7. The cytoskeleton: microtubules, microfilaments and intermediate filaments.. 8. Extracellular matrix, cell junctions and cell adhesion molecules.
Practical: 4. Chemical structure of lipids and their biological significance. The structure of membranes. Transport across membranes. Study of electron micrographs.

5th week:
Lecture: 9. Endocytosis, exocytosis, cell surface receptors. 10. Intracellular compartments and protein sorting.
Practical: 5. Comparison of the prokaryotic and eukaryotic cell. Eukaryotic cell types, organelles, cell components. Study of electron micrographs.

6th week:
Lecture: 11. Energy, catalysis, and biosynthesis.
Practical: 6. The GERL system. Endocytosis. Study of electron micrographs.
Self Control Test (1st self-control test in extra time)

7th week:
Lecture: 12. The mitochondrion and the biological oxidation. 13. The chloroplast and the photosynthesis.
Practical: 7. Cytoskeleton, cell junctions and extracellular matrix. Study of electron micrographs. Reaction catalysis.

8th week:
Lecture: No lecture scheduled.
Practical: 8. Photosynthesis, glycolysis, fermentation, terminal oxidation. Study of electron micrographs.

9th week:
Lecture: 14. The cell nucleus. 15. Chromatin and chromosomes.
Practical: 9. Cell nucleus, chromatin and chromosomes. Cell division I. Study of electron micrographs.

10th week:
Lecture: 16. The mechanics of cell division, mitosis. 17. Meiosis and fertilization
Practical: 10. Isoelectric point of ovalbumin and optimum pH of the ß-galactosidase. Examination on the use of light microscope.
Self Control Test (2nd self-control test in extra time)

11th week:
Lecture: 18. The regulation of the cell cycle.
Practical: 11. General principles of cytological staining. Ionic dyes. Staining of wool: a model experiment. Differential staining of the nucleus and cytoplasm. Examination on the use of light microscope.

12th week:
Lecture: 21. The bacterial cell division.
Practical: 12. Cytochemical reactions. Detection of DNA and polysaccharides. Examination on the use of light microscope.

13th week:
Lecture: 20. Cell signaling. General principles. 21. Signal transduction pathways.
Practical: 13. Immunocytochemical reactions. Demonstration of immunoglobulin producing lymphocytes. Examination on the use of light microscope.

14th week:
Lecture: No lecture scheduled.
Practical: 14. Cell division. Study of electron micrographs. Signaling.
Self Control Test (3rd self-control test in extra time)

15th week:
Lecture: No lecture scheduled.
Practical: 15. Selective staining of mitochondria by enzyme-cytochemical reactions. Examination on the use of light microscope. Evaluation of the semester.

Requirements

Pharmaceutical Biology I. (first semester subject) is a prerequisite of Pharmaceutical Biology II (second semester subject).

Conditions of signing the lecture book:

1, Attendance

Concerning attendance, the rules laid out in the EER of the University are clear.
The presence of students at laboratory practices and seminars is obligatory and will be recorded. The professor refuses his/her signature in the student's Lecture Book for the semester's course-work in the case of over four weeks of absence, even if the student has an acceptable excuse.
If the student is absent from more than two practices or seminars (taken together), the semester will be accepted only if they pass an examination based on the material covered by the laboratory classes and seminars of the semester (lab test).
Successful accomplishment of the laboratory practices will be controlled by signing the laboratory notes. If 3 or more practices will not be accepted, the lecture book will not be signed. These students must sit for a written exam from the laboratory material.
The presence of students on at least 50% of lectures is obligatory and will be recorded. The professor refuses his/her signature in the student's Lecture Book for the semester's course-work if the student was absent from more than 10 lectures, even if the student has an acceptable excuse.

2, Self-control tests

During the semesters there will be 3 self control tests offered. Participation in at least two of them is required for the signature.

3, Microscopy exam

The students also have to show up their knowledge in handling and setting the light microscope on an oral exam during the practices and also have to write a knowledge test about microscopy (passing limit is 50%). Both oral and written microscopy test have to be successfully completed for the signature. Unsuccessful exams can be repeated two times during the semester.

Exemption requests:

Applications for exemption (based on previous studies in other universities) should be submitted during the first two weeks of the semester. Requests are not accepted after that deadline! Exemption is granted only, if the student can pass an "Assessment of knowledge" test. The passing limit is 50%.

Rules concerning repeaters:

Attendance of labs and seminars for those repeaters who have a signed lecture book from the previous year (i.e. they failed, or they are repeaters because they have never taken Pharmaceutical Biology I. exam) is dispensable. Students should register for the subject electronically during the first weeks of the semester. They can take the three midterm tests in order to qualify for test bonuses and they take the regular exam at the end of the semester. Students, who did not earn a signature in the previous year have to register and attend the labs and seminars and they are considered as the other students registering the course at the first time.

End of semester examination (ESE)

There will be a written examination at the end of the first semester which covers all the material of the semester taken in the lectures, seminars, and laboratory practices (for a detailed list see the

University Bulletin). The examination questions include multiple choice, and short essay questions, figures, definitions, etc. The marks are based on the student's performance, expressed in percentage (%) as shown in the table below:

Percentage (%)	Grade
0 - 49.99	fail (1)
50.00 - 61.99	pass (2)
62.00 - 69.99	satisfactory (3)
70.00 - 79.99	good (4)
80.00 - 100	excellent (5)

The percentage values include the student's performance at the ESE as well as the bonus percentage they have obtained by taking the three mid-semester tests.
The following table shows the bonus percentage based on the average result of the semester tests. Absence counts as 0%. Bonuses are calculated only in the year of acquisition.

Average of the 3 tests (%)	Bonus %
50.00 - 53.99	3
54.00 - 57.99	4
58.00 - 61.99	5
62.00 - 65.99	6
66.00 - 69.99	7
70.00 - 73.99	8
74.00 - 77.99	9
78.00 - 81.99	10
82.00 - 85.99	11
86.00 - 100	12

ESE grade may be considered as part of the final exam mark upon the request of the student (see Pharmaceutical Biology II.).
The slides of the lectures and up-to-date information can be found at www.genetics.dote.hu, username and password will be published on the first lecture.

Department of Inorganic and Analytical Chemistry

Subject: **GENERAL CHEMISTRY PRACTICE**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Seminar: **15**
Practical: **60**

1st week:
Seminar: Atomic weight, molecular weight, empirical formula, molecular formula, amount of substance. Determination of empirical formula based on weight percent composition and on elemental analysis.

2nd week:
Seminar: Units of concentration, solution preparation. Interconversion of units.

3rd week:
Seminar: Interconversion of concentration units, exercises.

4th week:
Seminar: Exercises involving crystallization.
Practical: Introduction to chemical laboratory: General rules of laboratory work. Safety training. Introduction to laboratory equipment. Overview of received equipment. Use of gas burners (demonstration).

5th week:
Seminar: Composition of solid and gas mixtures. Stoichiometric calculations based on chemical equations.
Practical: Basic laboratory operations: Weighing on analytical and standard laboratory balances. Measurement of volume: pipette, burette, volumetric flask, solution preparation (demonstration). Calibration of a pipette.

6th week:
Seminar: Exercises based on acid-base titrations. Stoichiometric calculations based on chemical equations.
Practical: Grinding, preparation of solution, decanting, centrifuging, filtration (demonstration). Preparation of a standard solution from crystalline solid. Measurement of density: determination of the density of the prepared solution with a pycnometer, calculation of the weight percent composition.

7th week:
Seminar: Exercises in stoichiometry and concentration calculations.
Practical: Heating, cooling, use of a water bath (demonstration). Purification of a benzoic acid sample contaminated with sodium-chloride. Preparation of an alum (substance #1).

8th week:
Seminar: Gas laws, exercises connected to evolution of gases.
Practical: General mid-term test #1Determination of the composition of a mixture of KClO3 and Kcl. Melting point measurement: the melting point of Na2S2O3Determination of the melting point of purified benzoic acid. Substance #1 due in.

9th week:
Seminar: Balancing of redox reactions. Calculations based on redox reactions.
Practical: Demonstration of an acid-base titration. Preparation of a standard solution of sodium hydroxide by dilution of a concentrated solution. Concentration determination of the standard sodium hydroxide solution. Molecular weight determination of the purified benzoic acid based on acid-base titration. Purified benzoic acid due in.

10th week:
Seminar: Balancing of redox reactions. Calculations based on redox titrations.
Practical: Application of gas laws, gas handling in the laboratory: Laboratory work with gases (gas cylinders, other methods for gas generation). Preparation of oxygen gas in a laboratory gas generator, burning of sulfur in oxygen. Determination of molecular weight based on ideal gas law.

11th week:
Seminar: Exercises in concentration calculation and redox reactions.
Practical: Preparation of a salt from its metal (substance #2). Studies of reactions involving gas formation or precipitation.

12th week:
Seminar: Definition of pH. Calculation of pH for strong acids and bases.
Practical: Quantitative study of a precipitation reaction. Dependence of reaction rate on the

concentration of reactants. Substance #2 due in.

13th week:
Seminar: Calculation of pH for weak acids and bases.
Practical: Liquid-liquid extraction (demonstration). Study of buffer solutions (acetic acid - sodium acetate buffer and ammonia - ammonium chloride buffer). Hydrolysis of salts.

14th week:
Seminar: Electrochemical exercises. Review exercises.
Practical: Standard electrode potentials and chemical reactions. Study of a Daniell cell. Return of equipment.

Requirements

The objective of the laboratory work is to introduce first-year students of different background to laboratory work, the use of basic laboratory equipment, simple laboratory operations and measurements. In addition, students are expected to prepare certain simple chemicals and run various basic experiments to familiarize themselves with chemical laboratory work. The seminar involves solving exercises and problems connected to stoichiometry, concentration measurement and pH calculation. The lab manual will be made available to the students gradually during the semester as an English translation of the Hungarian original. The preparatory material to be studied before laboratory work is over-viewed before each experiment description in this manual. The weekly syllabus lists the particular topics covered and gives a full description of the experiments. The word ‘demonstration’ in the syllabus refers to experiments that the instructors carry out for the students. Students should come to lab sessions fully prepared. Students should learn the core theoretical background of the experiments (reading the material once is insufficient) and solve the pre-lab exercises in the lab manual every week before the lab session. The sections ‘Laboratory notes’ and ‘Review exercise and problems’ should be completed during the laboratory session. After each session the instructors overview the lab notes and make corrections if necessary. Students can ask questions regarding the laboratory preparation material during the seminar each week before the lab session. Each week the laboratory session begins with a short test (not more than 15 minutes) based exclusively on the preparatory material of that week and the previous week and the results of the experiments carried out the previous week. During the semester, students are required to write two general tests (week 8 and week 14) which are based on the course material for weeks 1-8 and 9-14, respectively. Grading is based on a five-level scale: 1 (fail), 2 (pass), 3 (average), 4 (good), 5 (excellent). The final course grade is given based on the results of these tests, the quality of the laboratory notes and the quality of laboratory work. The average score from both the short tests and the general tests must be above 2.00 to avoid a ‘fail’ final course grade. Students with ‘fail’ final course grade due to inadequate laboratory work have to retake the course the next year. Students with ‘fail’ final course grade due to low test results can re-take a comprehensive test exam in the examination period. It is not allowed to miss any laboratory practices/seminars. If a student misses one lab practice, medical certification is needed. If a student misses two or more lab practices/seminars even for any medical reasons, the student’s lecture book won’t be signed and she or he has to retake the course next year.

Subject: **GENERAL CHEMISTRY THEORY**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Lecture: **45**

1st week:
Lecture: Sciences and chemistry: Classification of natural sciences, history and development of chemistry. The concept of chemical change. Quantitative laws in chemistry, basic concepts of stoichiometry. The SI system of units, the most important physical quantities and units. Conservation of mass and energy. Einstein's equation on mass-energy equivalence. The law of definite proportion, the law of multiple proportions, law of combining gas volumes, Avogadro's law. Development of Dalton's atomic theory and its influence on chemistry. Relative atomic and molecular weights. Amount of substance and the definition of mole. Notations for elements and compounds, symbol, empirical formula, molecular formula, structure, isomerism. Valency and oxidation number. Oxidation number in inorganic compounds. Types of chemical reactions. Latin names of compounds.

2nd week:
Lecture: Characterization of macroscopic chemical systems, states of matter: Classification and structure of chemical systems. General characterization of different states of matter. The kinetic molecular theory of gases, ideal and real gases. Gas laws: Boyle's law, Charles's law, the ideal gas law. Gas mixtures, partial pressure. General characterization of liquids, surface tension, viscosity. General characterization and classification of solids. Changes of state: melting, freezing, evaporation, condensation, sublimation. Phase diagrams, critical temperature and pressure. Phase diagrams of water, sulfur and carbon dioxide. Thermodynamic temperature.

3rd week:
Lecture: Solutions: Classification of multicomponent systems, properties of solutions and mixtures. Solubility and units of concentration. Vapor pressure, freezing and boiling point of solutions. Osmosis pressure. Determination of molecular weight.

4th week:
Lecture: Thermochemistry: Thermochemical chemical equation, heat of reaction, Hess's law. The importance of heat of formation. Heat changes characteristic of changes of state. Heat of reaction and bond energies. The direction of spontaneous chemical reactions: internal energy, enthalpy, free energy and entropy.

5th week:
Lecture: Reaction rates: Dependence of reaction rates on concentrations and the temperature. Order of reactions. Activation energy. Catalysts, homogeneous and heterogeneous catalytic reactions. Enzymes. Photochemical processes.

6th week:
Lecture: Equilibrium: The equilibrium condition and the equilibrium constant. Possibilities to shift the composition of equilibria. Dependence of the equilibrium constant on temperature and pressure. Le Chatelier's principle.

7th week:
Lecture: Acid-base equilibria: Different theories of acid-base reactions (Arrhenius, Bronsted, Lewis). Characterization of aqueous solutions, electrolytic dissociation. Strength of acids and bases. Amphoteric substances. The definition and calculation of pH. Buffer solutions and acid-base indicators. Acid-base properties of salts. Complex ion equilibria. Basic of Pearson's hard-soft theory. Heterogeneous equilibria: Solubility equilibria, solubility product. Temperature dependence of solubility. gas-liquid and liquid-liquid equilibria. Extraction.

8th week:
Lecture: Redox reactions: Galvanic cells and the concept of electrode potential. Standard electrode potentials, oxidizing and reducing agents. Water

as a redox system. Electrolysis, voltage needed in electrolytic cells, over-voltage. Quantitative laws of electrolysis. Galvanic cells and batteries.

9th week:
Lecture: The structure of atoms: Experimental background of the atomic theory, discovery of the nucleus. Quantized changes in the energy states of atoms. The photon hypothesis. The Bohr Model of the atom. Characteristics of electromagnetic radiation, atomic line spectra, X-ray radiation.

10th week:
Lecture: The structure of the nucleus: Discovery and basic properties of subatomic particles (electron, proton, neutron). The mass defect. Isotopes. Types and properties of radioactive radiation. Laws of radioactive decay, decay series. Medical and other practical importance of radioactive isotopes. Nuclear energy, nuclear fission and fusion.

11th week:
Lecture: Quantum mechanical model of the atom: The dual nature of matter. Heisenberg's uncertainty principle. Schrödinger's equation and its application for the hydrogen atom. Quantum numbers and their importance. The shape of atomic orbitals. Characterization of poly-electronic atoms. Principles of the periodic table. Electronegativity, ionization energy, electronaffinity, atomic and ionic radii and their change across the periodic table.

12th week:
Lecture: The chemical bond: The ionic bond. Calculation of the lattice energy. The covalent bond. basic of the molecular orbital theory and its application for diatomic molecules. The valence shell electron pair repulsion model. The shape of molecules, bond angles, bond orders, hybridization. polarity of covalent bonds, polar and non-polar molecules. Metallic bonding.

13th week:
Lecture: Structure and bonding of chemical systems: Intermolecular forces. Hydrogen bond and its importance in inorganic and organic chemistry. General characterization of molecular, ionic, metallic, and network atomic solids. The band model. Characteristics of insulators, semiconductors and conductors. Dielectric and magnetic properties: dia-, para- and ferro-magnetic materials.

14th week:
Lecture: Principles of chemical structure determination: Principles and application of mass spectrometry. Electromagnetic spectra, atom and molecule spectroscopy. Principles and application of infrared spectroscopy. The chemical importance of NMR and ESR spectroscopies. Mössbauer spectroscopy. Diffraction methods.

15th week:
Lecture: Principles of chemical structure determination: Principles and application of mass spectrometry. Electromagnetic spectra, atom and molecule spectroscopy. Principles and application of infrared spectroscopy. The chemical importance of NMR and ESR spectroscopies. Mössbauer spectroscopy. Diffraction methods.

Requirements

Test after the completion of the semester, no midterm tests, sample test questions provided on the website in the beginning of December (/www.inorg.unideb.hu/)

Department of Pharmaceutical Technology

Subject: **PHARMACY PROPEDEUTICS**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: The methods of Greek, Roman and Arab treatments.
Practical: The methods of Greek, Roman and Arab treatments.

2nd week:
Lecture: Pharmaceutics in ancient times and in middle ages.
Practical: Pharmaceutics in ancient times and in middle ages.

3rd week:
Lecture: The development of anatomical and morphological thinking.
Practical: The development of anatomical and morphological thinking.

4th week:
Lecture: The development of bacteriological thinking.
Practical: The development of bacteriological thinking.

5th week:
Lecture: The development of physiological thinking.
Practical: The development of physiological thinking.

6th week:
Lecture: The history of the development of medical departments.
Practical: The history of the development of medical departments.

7th week:
Lecture: Factors that helped in the development of theoretical and practical pharmacy in Hungary.
Practical: Factors that helped in the development of theoretical and practical pharmacy in Hungary.

8th week:
Lecture: The development of pharmacies.
Practical: The development of pharmacies.

9th week:
Lecture: The pharmaceutical career as a profession.
Practical: The pharmaceutical career as a profession.

10th week:
Lecture: The structural build-up of the Hungarian public health.
Practical: The structural build-up of the Hungarian public health.

11th week:
Lecture: Drug as remedy.
Practical: Drug as remedy.

12th week:
Lecture: Grouping of drugs. (origin, therapeutic effect, the area of utilization, the method of administration)
Practical: Grouping of drugs. (origin, therapeutic effect, the area of utilization, the method of administration)

13th week:
Lecture: Drug supply. The functional conditions of pharmacies (personal, material).
Practical: Drug supply. The functional conditions of pharmacies (personal, material).

14th week:
Lecture: The professional books, journals in a pharmacy. (Pharmacopoeia, Hungarian/foreign). Formulae Normales (pharmaceutical and medical edition). Prescriptions.
Practical: The professional books, journals in a

pharmacy. (Pharmacopoeia, Hungarian/foreign). Formulae Normales (pharmaceutical and medical edition). Prescriptions.

15th week:
Lecture: Test.
Practical: Test.

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam.
Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn't attend 30% of lectures.

Department of Solid State Physics

Subject: **PHYSICS**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Lecture: **15**
Practical: **30**

1st week:
Lecture: What is physics: the nature of the laws in science and physics.

2nd week:
Lecture: Classical Mechanics. Description of the motion. Kinematics.

3rd week:
Lecture: The mechanics of point masses. Newton's laws. Mass and force laws.

4th week:
Lecture: Conserved quantities. Momentum, angular momentum, work and energy.

5th week:
Lecture: Gravity: Kepler's laws, Force fields, The inverse square law.

6th week:
Lecture: Vibrations: Harmonic vibration, force law and energy conservation.

7th week:
Lecture: Waves in elastic media: Hook's law. Propagation of disturbances. The wave equation, Propagating and standing waves.

8th week:
Lecture: Electrostatics. Charges, Coulomb's law, electrostatic potential.

9th week:
Lecture: Electromagnetism. The Lorentz force, magnetic fields. Induction, electromagnetic waves.

10th week:
Lecture: Geometrical Optics: The laws of reflection and refraction. Fermat's principle. Optical lenses and image formation.

11th week:
Lecture: Physical optics: Wave propagation, and interference, Huygens Fresnel principle, Light waves, color.

12th week:
Lecture: Introduction to quantum mechanics: Matter waves. The dual nature of light, The Schrodinger equation. Atomic spectra and the structure of atoms.

13th week:
Lecture: Thermal physics. Temperature scales.

The ideal gas. The black body radiation.

14th week:
Lecture: Nuclear physics: Radioactivity. Radiations. The mass defect. The structure of the nucleus.

15th week:
Lecture: The worldview of modern physics. Elementary particles, The structure of the universe, The separation scales. Fractals, Complexity.

Requirements

Aim of the courses is to introduce the basic concepts and quantities for natural science studies. Aim of the practice is to provide skills to apply physical laws to simple situations to derive quantitative result, and use physical quantities properly.

Course topics
1. Kinemics, description of motion, veloxity, acceleration, path, path length
2. Planar motion, projectiles, rotation, vibration.
3. Force and mass. The axioms of the Newtonian mechanics, The equation of motion, Harmonic oscillator.
4. Conserved quantities. Energy, momentum, work and potential energy,
5. Gravitastional force. Planetary motion. Kepler1s laws. Cavendish experiment. The mass of earth.
6. Ideal gas: the concept of temperature. Origin of the ideal gas law. .The law of equipartition.
7. Ellastic media, the hooks law, waves, wave propagation, wave equation, harmonic waves.
8. Wave propagation in three dimensiopns. Wave surface, refraction and interferrence. Transversal and longitudinal waves. Polaeisation.
9. The light. Propagation velocity. geometrical optics of light rays, reflection, refraction. relative and absolute index of refraction the Fermat principle.
10. Electromagnetism. Descriptive properties of the electrostatic and magnetic fields. Coulombs law.
11. Light as an electromagnetic wave, and light as a quanta. Connection between the color and the wavelength, The photon, Photoelectric effect.
12. Interaction of light and matter. Thermal radiation of the absolute black body. The planc constant. The Broglie relation, The structure of the atom. Description of the spectrum lines.
13. The nucleon. Law of radioactive decay. binding energy and the mass defect. Description of the nuclear forces.
14. Consultation

Requirements for the practice is the comletition of two problem solving tests during the semester. The course is graded based on the written exam results.

Department of Anatomy, Histology and Embryology

Subject: **PHARMACEUTICAL ANATOMY**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **45**
Practical: **30**

1st week:
Lecture: Covering and lining epithelia. Glandular epithelium. Connective tissues.
Seminar: Histology of epithelial tissues.

Practical: Epithelial tissues. Demonstration: 1. Endothel (small intestine, HE) 2. Columnar epithelium (small intestine, brush border, HE) 3. Pseudostratified epithelium with cilia (trachea, HE) 4. Stratified squamos non-keratinizing epithelium (oesophagus, HE) 5. Stratified squamos keratinizing epithelium (fingertip, HE) 6. Sebaceous, sweat and apocrine glands (axillary skin, HE) 7. Mucous and serous glands(submandibular gland, HE)

2nd week:
Lecture: Adipose tissue. Cartilage. Bone. Bone formation. Muscle tissue.
Seminar: Histology of connective tissue.
Practical: Histology: Connective tissue. Demonstration: 1. Mesenchyme (umbilical cord, HE). 2. Fibroblasts (healing wound, HE). 3. Mast cell (healing wound, toluidine blue). 4. Macrophages (skin, trypane blue-nuclear fast red). 5. Collagen fiber (colon, HE). 6. Elastic fiber (aorta, orcein). 7. Reticular fiber (liver, AgNO impregnation).

3rd week:
Lecture: Blood vessels. Blood. Bone marrow and blood formation.
Seminar: Histology of adipose tissue, cartilage and bone.
Practical: Histology: Adipose tissue. Cartilage. Bone. Demonstration: 1. Adipocytes (suprarenal gland, HE). 2. Hyaline cartilage (trachea, HE). 3. Elastic cartilage (epiglottis, orcein). 4. Fibrous cartilage and bone (knee joint, HE). 5. Bone, cross-section (Schmorl's stain).

4th week:
Lecture: Histology of lymphatic organs I. Histology of lymphatic organs II. Fertilization. Cleavage.
Seminar: Histology of bone formation and muscle tissue.
Practical: Histology: Bone formation. Muscle tissue. 1. Enchondral ossification epiphyseal growth plate (knee joint, HE). 2. Skeletal muscle (HE) Demonstration: 3. Skeletal muscle (iron-hematoxylin). 4. Smooth muscle (small intestine, HE). 5. Cardiac muscle (PTAH).

5th week:
Lecture: Gastrulation, formation of the mesoderm. Differentiation of the ectoderm and mesoderm. Differentiation of the entoderm, folding of the embryo.
Seminar: Histology of blood vessels, blood, bone marrow.
Practical: Histology: Blood vessels. Blood. Bone marrow. Blood formation. 1. Elastic artery (orcein). 2. Muscular artery and vein (HE). 3. Arteriole, venule, capillary (colon, HE). 4. Blood smear (May-Grünwald-Giemsa). 5. Bone marrow (HE).

6th week:
Lecture: Featal membranes. Placenta. The fetal period. Twins. Anatomical terminology. Osteology and arthrology introduction.
Seminar: Histology of lymphatic organs.
Practical: Histology: Histology of lymphatic organs. 1. Thymus (HE).Demonstration: 2. Lymphatic follicle (colon, HE). 3. Lymph node (HE). 4. Spleen (HE). 5. Palatine tonsil (HE).

7th week:
Lecture: The upper limb. The lower limb. The skull and the back.
Seminar: Anatomy of upper and lower limb.
Practical: Anatomy: Upper and lower limbs. The bones, joints, muscles, blood vessels and nerves of the upper limb. Sites of venous injections and measurement of blood pressure. Bones, ligaments and membranes of the pelvis. The structure and function of the pelvic girdle. The bones, joints, muscles, blood vessels and nerves of the lower limb. Sites of muscular injections. Femoral canal.

8th week:
Lecture: Anatomy of the head and neck. Nasal and oral cavities. The pharynx and the larynx.
Seminar: Anatomy of head, neck and back.
Practical: Anatomy: The anatomy of the head, neck and back Subdivisions of the skull. Calvaria and base of the skull. Sutures and fontanelles. The bony orbit, nasal cavity and paranasal sinuses. Temporomandibular, atlantooccipital and atlantoaxial joints. Overview of the anatomy of the head and neck. Sensory and motor

innervation of the face. Muscles of facial expression. The parotid gland. Common carotid artery and its branches. Internal and external jugular veins. Cervical plexus. Define the location of the hyoid bone, thyroid gland and thyroid cartilage. Site of conicotomy. Surface projection of the apex of the lung. The larynx and the pharynx. The structure of the vertebral column.

9th week:
Lecture: The heart I. The heart II. The trachea, lungs and pleura.
Seminar: Anatomy of the heart and respiratory system.
Practical: Anatomy: The anatomy of the heart and the respiratory system. The structure of the wall of the thorax. Lymphatic drainage of the mammary gland. The lungs, pleura and pleural recesses. The root of the lung. The heart. The pericardium and its sinuses. The mediastinum and its major parts.

10th week:
Lecture: Histology of the lung. Development of the lung and heart. Circulatory system. The vascular system of the embryo.
Seminar: Histology of the respiratory system.
Practical: Histology: The histology of the respiratory system.1. Larynx (HE).2. Trachea (HE).3. Lung (HE).Demonstration:4. Lung injected with indian ink (HE).

11th week:
Lecture: Development and general organization of the alimentary system. The oesophagus. The stomach. Small and large intestines.
Seminar: Anatomy of the alimentary system.
Practical: Anatomy: The anatomy of the alimentary system. The structure and layers of the abdominal wall. The stomach, the duodenum, the liver, the pancreas and the spleen. Demonstration of some parts of the small and large intestines. The peritoneum. The abdominal aorta and its branches. Lymphatic drainage of the abdominal cavity. The diaphragm.

12th week:
Lecture: The pancreas. The liver I. The liver II. The system of the portal vein. The peritoneum. The retroperitoneum.
Seminar: Histology of the alimentary system.
Practical: Histology: The histology of the alimentary system. 1. The stomach (HE). 2. Jejunum (HE). 3. Colon (HE).Demonstration: 4. Vermiform appendix (HE). 5. Liver (pig, HE). 6. Pancreas (HE).

13th week:
Lecture: Neuroendocrine regulation. The hypothalamo-hypophyseal system. The pineal, thyroid, parathyroid and suprarenal glands. The kidney
Seminar: Histology of the endocrine system.
Practical: Histology: Histology of the endocrine system. 1. Pituitary gland (HE). 2. Thyroid gland (HE). 3. Parathyroid gland (HE). 4. Suprarenal gland (HE).

14th week:
Lecture: The urinary system. Male genital organs
Seminar: Anatomy of the urogenital system.
Practical: Anatomy of the urogenital apparatus. Location and capsules of the kidney. The kidney in a transverse section. Visceral relation of pelvic organs. Demonstration of male and female pelvis organs. Demonstration of external genital organs. Internal iliac artery. Sacral plexus.

15th week:
Lecture: Female genital organs I. Female genital organs II. Development of the urogenital system
Seminar: See: practical
Practical: Histology of the kidney and genital organs 1. Kidney, transverse section (HE) 2. Testis and epididymis (HE) 3. Ovary (HE) Demonstration: 4. Corpus luteum (HE) 5. Uterus, progesteron phase (HE)

Requirements

Concerning attendance, the rules written in the Regulations Governing Admission, Education and

Examinations of the University are valid. The presence in practices, seminars and lectures will be recorded. The head of the department may refuse to sign the Lecture Book if a student is absent more than twice from practices and seminars in one semester even if he/she has an acceptable reason.
The program of the lectures, seminars and practices are written in the University Calendar.
Rules of examinations:
Midterm examinations:
Two midterm examinations will be held, one on the 7th week and the other on the 15th week. The exams cover the topics of lectures, seminars and practices of the second semester.
Evaluation of the midterm examinations
The midterm exams will be evaluated with points and the points of the two examinations will be added. Students with scores higher than 60% earn an exemption from the final examination with a mark that will be calculated on the basis of the overall performance on the two midterm examinations.

End-semester exam
The end-semester exam is a written exam that covers the topics of lectures, seminars and practices of the semester. The exam will be evaluated with points that will be converted into final mark in the following way:

0 – 59 %	fail (1)
60 – 69 %	pass (2)
70 – 79 %	satisfactory (3)
80 – 89 %	good (4)
90 – 100 %	excellent (5)

Registration for the exam and postponement: Through the NEPTUN system

Reading materials
A. Birinyi: Anatomy
K.L. Moore, and A.M.R. Agur: Essential Clinical Anatomy 2nd Edition, Lippincott Williams and Wilkins, 2002. ISBN: 0-78172830-4.
L.P. Gartner: Concise Histology. Saunders Elsevier, 2011. ISBN: 978-0-7020-3114-4.
T.W.Sandler: Langam's Medical Embryology. 10.th Edition, Lippincott Wiiliams and Wilkins 2006. ISBN: 0-7817-9485-4.
Sobotta: Atlas of Human Anatomy I-II. 14th Edition Urban and Schwanrzenberg, ISBN: 978-0-443-10349-0.

Department of Foreign Languages

Subject: **HUNGARIAN LANGUAGE I/2.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Organization of the course. Revision

2nd week:
Practical: Pretest

3rd week:
Practical: Unit 6

4th week:
Practical: Unit 6

5th week:
Practical: Unit 7

6th week:
Practical: Unit 7

7th week:
Practical: Unit 8

8th week:
Practical: Revision. Mid-term test

9th week:
Practical: Unit 9

10th week:
Practical: Unit 10

11th week:
Practical: Unit 10

12th week:
Practical: Unit 11

13th week:
Practical: Unit 11

14th week:
Practical: Revision. End-term test.

15th week:
Practical: Oral minimum requirement exam. Evaluation

Requirements

Attendance
Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the final signature is refused and the student must repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.

Testing, evaluation
In each Hungarian language course, students must sit for 2 written language tests and a short minimal oral exam.
A further minimum requirement is the knowledge of 200 words per semester announced on the first week. There is a (written or oral) word quiz in the first 5-10 minutes of the class, every week. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam that includes all 200 words along with the oral exam. The results of word quizzes may modify the end-semester evaluation.
The oral exam consists of a role-play randomly chosen from a list of situations announced in the beginning of the course. Failing the oral exam results in failing the whole course. The result of the oral exam is added to the average of the mid-term and end-term tests.
Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 59	fail (1)

60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60, the student once can take an oral remedial exam covering the whole semester's material.

Consultation classes
In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.

Course book: See the website of the department.

Website: Audio files to the course book, oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Subject: **LATIN LANGUAGE II.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: The 3rd declension, declension of adjectives of one or two endings

2nd week:
Practical: Muscles

3rd week:
Practical: Comparision of adjectives, prefixes and prepositions

4th week:
Practical: Latin conjugation

5th week:
Practical: The digestive system

6th week:
Practical: Routes of drug administration. Participles. The fourth and fifth declension.

7th week:
Practical: Prescriptions related to the GI tract.

8th week:
Practical: The respiratory system.

9th week:
Practical: Medicines of the respiratory system

10th week:
Practical: Latin diminutives. The skin.

11th week:
Practical: Dermatological problems and skin preparations.

12th week:
Practical: The cardiovascular system.

13th week:
Practical: Blood and blood vessels. Pharmacology of the cardiovascular system.

14th week:
Practical: Prescriptions related to the nervous system.

15th week:
Practical: Evaluation.

Requirements

Attendance
Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the final signature is refused and the student must repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.

Testing, evaluation
In each Latin language course, students must sit for 2 written language tests.
A further minimum requirement is the knowledge of 300 words per semester announced on the first week. There is a (written or oral) word quiz in the first 5-10 minutes of the class, every week. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam that includes all 300 words along with the oral exam. The results of word quizzes can modify the evaluation at the end of the semester.
Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 5	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60, the student once can take an oral remedial exam covering the whole semester's material.

Consultation classes
In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.

Coursebook: Takácsné Tóth Emőke: Latin for Pharmacy Students II.

Website: Minimum vocabulary lists and further details are available on the website of the Department of Foreign Languages: ilekt.med.unideb.hu

Department of Human Genetics

Subject: **PHARMACEUTICAL BIOLOGY II.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **35**
Practical: **30**

1st week:
Lecture: (1) Cytogenetics I. Karyogram, ideogram, banding techniques. Human autosomal trisomies. (2) Cytogenetics II. Abnormalities of the X and Y chromosomes. Structural aberrations of human chromosomes. (3) Genes and alleles. Mendelian laws.
Practical: Seminar: Introduction to genetics. Separation of cell organelles by density gradient centrifugation. DNA, RNA, protein separation techniques.

2nd week:
Lecture: (4) Transmission genetics. Dominant, recessive and sex-linked inheritance. (5) Recombination of non-allelic genes. (6) Gene interactions. Mitochondrial inheritance.
Practical: Seminar: Cytogenetics.

3rd week:
Lecture: (7) Human mendelian traits and diseases. Inborn errors of metabolism. (8) Genetics of blood groups and HLA system. (9) DNA polymorphisms.
Practical: Seminar: Transmission genetics.

4th week:
Lecture: (10) Polygenic inheritance and multifactorial traits. (11) From gene to phene. Molecular view of genotype and phenotype. Molecular mechanisms of genetic diseases. (12) DNA as genetic material. The structure of the DNA.
Practical: Seminar: Pedigree analysis. Problem solving and seminar on mendelian genetics.

5th week:
Lecture: (13) Replication of prokaryotic and eukaryotic DNA.
Practical: Study of sex chromatin. Demonstration of mammalian chromosomes. Preparation of metaphase spreads.
Self Control Test (1st self-control test in extra time.)

6th week:
Lecture: (14) Prokaryotic transcription. (15) Prokaryotic and eukaryotic translation. (16) Gene regulation in prokaryotes. Operons.
Practical: Detection of human polymorphism by polymerase chain reaction.

7th week:
Lecture: (17) DNA repair. (18) Mutations, mutagenic effects and agents. Ames test. Dynamic mutations. (19) Transformation, transduction.
Practical: Induction of beta-galactosidase in E. coli cells. PCR evaluation of the human polymorphism experiment.

8th week:
Lecture: (20) Conjugation in bacteria, plasmids. (21) Gene regulation in eukaryotes I. (22) Gene regulation in eukaryotes II.
Practical: Seminar: Gene structure and function.

9th week:
Lecture: (23) Homologous and specific recombination. (24) IS elements, transposons. (25) Gene engineering (Recombinant DNA) I.
Practical: Seminar: Mutation and polymorphisms.

10th week:
Lecture: (26) Gene engineering (Recombinant DNA) II. (27) Application of recombinant DNA in biotechnology and biomedical sciences I.
Practical: Seminar: Gene regulation, operons.
Self Control Test (2nd self-control test in extra time.)

11th week:
Lecture: (28) Application of recombinant DNA in biotechnology and biomedical sciences II. (29) Pharmacogenetics, pharmacogenomics.
Practical: Complementation test. The gene concept.

12th week:
Lecture: (30) Ecogenetics and ecogenomics. Genetic polymorphism of human populations. (31) Molecular genetics of the cell cycle. Cancer genetics.
Practical: Transformation of Escherichia coli.

13th week:
Lecture: (32) Developmental genetics. (33) Population genetics I.
Practical: Seminar: Bacterial genetics.

14th week:
Lecture: (34) Population genetics II. (35) Genomics, proteomics, the human genome project.
Practical: Seminar: Gene regulation in eukaryotes.
Self Control Test (3rd self-control test in extra time.)

15th week:
Practical: Seminar: Recombinant DNA.

Requirements

The prerequisite of Pharmaceutical Biology II. (second semester subject) is Pharmaceutical Biology I. (first semester subject). Students are not allowed to register until they have a successful ESE in Pharmaceutical Biology I.

Conditions of signing the lecture book:
1, Attendance
Concerning attendance, the rules laid out in the EER of the University are clear.
The presence of students at laboratory practices and seminars is obligatory and will be recorded. The professor refuses his/her signature in the student's Lecture Book for the semester's course-work in the case of over four weeks of absence, even if the student has an acceptable excuse.
If the student is absent from more than two practices or seminars (taken together), the semester will be accepted only if they pass an examination based on the material covered by the laboratory classes and seminars of the semester (lab test).
Successful accomplishment of the laboratory practices will be controlled by signing the laboratory notes. If 3 or more practices will not be accepted, the lecture book will not be signed. These students must sit for a written exam from the laboratory material.
The presence of students on at least 50% of lectures is obligatory and will be recorded. The professor refuses his/her signature in the student's Lecture Book for the semester's course-work if the student was absent from more than 17 lectures, even if the student has an acceptable excuse.

2, Self-control tests
During the semesters there will be 3 self control tests offered. Participation in at least two of them is required for the signature.

Exemption requests:
Applications for exemption (based on previous studies in other universities) should be submitted during the first two weeks of the semester. Requests are not accepted after that deadline! Exemption is granted only, if the student can pass an "Assessment of knowledge" test. The passing limit is 50%.

Rules concerning repeaters:
Attendance of labs and seminars for those repeaters who have a signed lecture book from the previous year (i.e. they failed, or they are repeaters because they have never taken Pharmaceutical Biology II. exam) is dispensable. Students should register for the subject electronically during the first weeks of the semester. They can take the three midterm tests in order to qualify for test bonuses and they take the regular exam at the end of the semester. They cannot have home-work bonuses. Students, who did not earn a signature in the previous year, have to register and attend the labs and seminars and they are considered as the other students registering the course at the first time.

Final Examination (FE):
There will be a written examination at the end of the semester which covers all the material of the two semesters taken in the lectures, seminars, and laboratory practices (for a detailed list see the University Bulletin). The examination questions include multiple choice, and short essay questions, figures, definitions, etc. The marks are based on the student's performance, expressed in percentage (%) as shown in the table below:

Percentage (%)	Grade
0 - 49.99	fail (1)
50.00 - 61.99	pass (2)
62.00 - 69.99	satisfactory (3)
70.00 - 79.99	good (4)
80.00 - 100	excellent (5)

The percentage values include the student's performance at the FE as well as the bonus percentage they have obtained by taking the three mid-semester tests.
The following table shows the bonus percentage based on the average result of the semester tests. Absence counts as 0%.

Average of the 3 tests (%)	Bonus (%)
50.00 - 53.99	1
54.00 - 57.99	2
58.00 - 61.99	3
62.00 - 65.99	4
66.00 - 69.99	5
70.00 - 73.99	6
74.00 - 77.99	7
78.00 - 81.99	8
82.00 - 85.99	9
86.00 - 100	10

Further bonuses can be given for the timely completion of the following midterm homeworks:

Problem solving in genetics (2 bonuses)
Analysis of human karyograms (1 bonus)
Data search in human genetic databanks through the Internet (1 bonus)
Maximum number of the bonuses in the second semester is 14. Bonuses are calculated only in the year of acquisition.
FE includes cell biology (Pharmaceutical Biology I.) and genetics & molecular biology (Pharmaceutical Biology II). Those students, who ask in advance to have their ESE mark in Pharmaceutical Biology I. to be considered as a part of their grade on the FE will be exempted from cell biology. They have to take examination only in genetics & molecular biology. However, this examination includes the following topics from the first semester: DNA, chromatin, chromosomes, nucleus, cell cycle and cell division of eukaryotes and prokaryotes, since these are topics covered by genetics, as well. In this case the final grade of the FE is calculated as the average of the results of the ESE and the genetics exam taken at the end of the second semester. None of the grades can be fail (1) and in dubious cases the result of the genetics exam is accounted more.
The slides of the lectures and up-to-date information can be found at www.genetics.dote.hu, username and password will be published on the first lecture.

Department of Inorganic and Analytical Chemistry

Subject: **INORGANIC AND QUALITATIVE ANALYTICAL CHEMISTRY PRACTICE**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Seminar: **15**
Practical: **75**

1st week:
Practical: Inorganic and analytical laboratory rules (exposition). Laboratory safety (exposition). Distribution of laboratory equipment. Reaction of potassium chlorate with red phosphorus (demonstration). Reaction of hydrogen sulfide with sulfur dioxide (demonstration). Preparation of solutions of ammonium sulfide and polysulfide. The decomposition of polysulfide (demonstration). Laboratory preparation of hydrogen with the use of Kipp-apparatus and combustion of hydrogen.

2nd week:
Practical: Laboratory preparation of chlorine and its reaction with metals (team study). Preparation of chlorine by reacting NaClO (hypo) with HCl (reading). Reaction of alkali-chlorides, -bromides and iodides with concentrated (cc) H2SO4. Reactions of hypochlorite ion. Laboratory preparation of oxygen gas (reading). Combustion of elements in oxygen (reading). Reactions of hydrogen peroxide. Preparation and reactions of hydrogen sulfide. Chemical properties of sulfurous and sulfuric acid.

3rd week:
Practical: Laboratory preparation of nitrogen. Chemical properties of ammonia, oxidation of NH3 by halogens (team study). Preparation and study of nitrogen monoxide (team study). Preparation and chemical properties of nitric acid and nitrates. Experiments with phosphorus and with phosphorus pentoxide.

4th week:
Practical: Properties of carbon dioxide (team study). Preparation, properties and study of carbon monoxide (team study)Experiments with boric acid and reactions of borate ion. Reactions of alkali and alkaline earth metals with water (team study). Properties of carbon dioxide (team study). Preparation, properties and study of carbon monoxide (team study). Experiments with boric acid and reactions of borate ion. Reactions

of alkali and alkaline earth metals with water (team study). Solution of alkali and alkaline earth metals in liquid ammonia (demonstration). Interaction of aluminum, lead and tin with acids and bases. Interaction of iron, copper and zinc with acids and bases.

5th week:
Practical: Practical classification of reactions and ions. The reactions of anions: The analysis of anion group I (Carbonate, hydrogen carbonate, silicate, sulfide, polysulfide and sulfite ions). Identification of halogenate ions. Purity tests: Investigation of bromate impurity in KBr.
6th week:
Practical: Identification of bromide and iodide ions coexisting in solution with the use of chlorine water. Identification of chloride ion in the presence of bromide or/and iodide (Berg's reaction). Unknown sample: Detection of two anions of group I-III in a solution of two alkali metal salts (CO32- ; HCO3-; S2- ; SO32- ; SO42- ; PO43- (HPO42- ; H2PO4-); F- ; BrO3- ; IO3--). Voluntary test: The same as unknown sample, but solution is given.

7th week:
Practical: Identification of bromide and iodide ions coexisting in solution with the use of chlorine water. Identification of chloride ion in the presence of bromide or/and iodide (Berg's reaction).>Unknown sample: Detection of two anions of group I-III in a solution of two alkali metal salts (CO32-; S2- ; SO32-; SO42-; PO43- (HPO42- ; H2PO4-); F- ; BrO3- ; IO3- ; Cl- ; Br-; I-; SO32-and SO42- ions do not co-exist).Voluntary test: Detection of one or two anions of group I-III in a solution of two alkali metal salts (CO32-; S2- ; SO32-; SO42-; PO43- (HPO42- ; H2PO4-); F- ; BrO3- ; IO3- ; Cl- ; Br-; I-; SO32-and SO42- ions do not co-exist).

8th week:
Practical: The analysis of anion group IV (nitrite, nitrate and chlorate ions). Detection of nitrite and nitrate ions with Griess-Ilosvay reagent. Unknown sample: Detection of two anions of group I-IV in a mixture of two alkali metal salts (CO32-; S2-; SO32-; SO42-; PO43- (HPO42-;.H2PO4-); F-; BrO3-; IO3-; Cl-; Br-; I-; NO2- and NO3-). The pairs of : SO32- - SO42- ; Br- - NO3- and I- - NO3- are not given.).Voluntary test: The same as unknown sample, but solution is given.

9th week:
Practical: The reactions of cations. The analysis of cation group I and group II A (Copper (II), silver (I), cadmium (II), mercury (I), mercury (II), lead (II) and bismuth (III) ions). Purity tests: Investigation of lead impurity in boric acid.

10th week:
Practical: Sanger - Black's test for trace analysis of arsenic impurity in solution (demonstration). Purity test: Investigation of silver impurity in "bismuth subnitrate, heavy". Unknown sample: Detection of two cations of group I or II A in a solution (Ag+; Cd2+; Hg22+; Hg2+; Pb2+; Bi(III) (Hg22+ - Hg2+ and Cu2+ - Hg22+ ions are not given together)Voluntary test: Detection of one or two cations of group I and II A in solution (Hg22+ - Hg2+ and Cu2+ - Hg22+ ions are not given together).

11th week:
Practical: The analysis of cation group II B (Arsenic (III), arsenic (V), antimony (III), antimony (V), tin(II) and tin (IV). Reactions of permanganate, chromate and dichromate ions. Oxidation states of transition metals belonging to 3d row in aqueous solutions. Use of organic reactions in analysis. Purity test : Investigation of iron impurity in citric acid.

12th week:
Practical: The analysis of cation group III: (Nickel (II), cobalt (II), iron (II), iron (III), manganese (II), chromium (III), zinc (II) and aluminium (III) ions). "Fluoride test" for aluminium (demonstration).Detection of traces of nickel in cobalt salts. Preparation and properties of cyanide complexes of some transition metal ions. Unknown sample: Detection of two cations of group III in solution (The oxidation state of Fe and Cr can be +3, and the oxidation state of Mn can be +2 only). Voluntary test: Detection of one or two cations

of group III in solution (The oxidation state of Fe and Cr can be +3, and the oxidation state of Mn can be +2 only).

13th week:
Practical: The analysis of cation group IV (calcium (II), strontium (II) and barium (II) ions). The analysis of cation group V (magnesium (II), lithium (I), sodium (I), potassium (I) and ammonium ions). Detection of traces of ammonia (demonstration). Reaction of Sr2+ and Ba2+ ions with sodium rhodizonate Salts of alkali metal ions with poor solubility of water. Unknown sample: Detection of two cations of group I, II A, III, IV or V in solution (One component is a cation of group I, II A or III (Cu2+; Ag+; Cd2+; Hg22+; Hg2+; Pb2+; Bi (III); Ni2+; Co2+; Fe2+; Fe3+; Mn2+; Cr3+; Zn2+; Al3+) and the other one is a cation of group IV or V (Ca2+; Sr2+; Ba2+; Li+; Na+; K+; NH4+). The oxidation state of Cr is +3, and the oxidation state of Mn is +2. Fe can be in oxidation state +2 or +3).Voluntary test: The same as the unknown sample (solution is given).

14th week:
Practical: Summary on group reactions. Complete qualitative analysis of a solid sample. Unknown sample: Complete qualitative analysis (cations, anions) of a solid mixture of two components. The cations or the anions in the two components are the same. This way the number of the detectable ions is 3. The same cations can be in the sample which were investigated formerly (Cu2+; Ag+; Cd2+; Hg2+; Pb2+; Bi(III); Ni2+; Co2+; Fe3+; Mn2+; Cr3+; Zn2+; Al3+; Ca2+; Sr2+; Ba2+; Li+; Na+; K+; NH4+), but Mg2+ is not given, and also two cations of group IV and of group V cannot be together. The oxidation state of Hg, and Mn can be +2 only, oxidation state of Fe and Cr can be +3. The possible anions are as follows: CO32- (HCO3-) ; SO42- ; PO43- (HPO42-; H2PO4-); F-; Cl-; Br-; I-; NO3- The various protonated forms of the anions cannot be identified. Inventory and return of laboratory equipment.

Requirements

The laboratory course of 84 hours consists of seminars (1 class hours per week) and laboratory practices (5 hours per week). The course is given during 14 weeks. In the seminars the theoretical background of the laboratory investigations and some special or particular problems of analytical operations of the current experiments are discussed. The practices help students to get knowledge of material and to have training in the qualitative analytical laboratory operations and in compilation of laboratory reports. In the first four practices some experiments and test tube reactions relating mostly to inorganic chemistry are required to perform. From Practice 5 the sequence of the analytical topics follows the classical Fresenius' system. In the first part of the practices it is required to obtain some skills and experiences in the identification and separation of the relevant species. This work is followed by the analysis of "unknown samples". Sometimes special experiments are performed collectively by small teams (team study). The demonstration experiments are similar. In these cases the experiments are supervised by the teacher. Some purity tests were taken from the official European Pharmacopoeia or Hungarian Pharmacopoeia. Students who finish the actual practice sooner can analyse an extra "voluntary test", too. At the beginning of every practice the students are required to write a test relating to the theoretical background and practical questions of the current experiments. For these tests and for the analysis of unknown samples, grades are given. The purity tests are qualified as "acceptable" or "not acceptable". The final qualification is determined by the grades and by the quality of the laboratory reports. Depending on the qualification of purity tests and the volume of voluntary tests, the final grade can be rounded.

Subject: **INORGANIC AND QUALITATIVE ANALYTICAL CHEMISTRY THEORY**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **45**

1st week:
Lecture: Elements in the periodic table. Classification of the elements. Production of the elements by separation and by chemical (metallurgical) methods. Preparation of the non-metallic elements by oxidation. Reduction of metal oxides by carbon, hydrogen or metals. Thermal decomposition of metal-halides and carbonyls. Preparation and purification of metals by electrolysis. Hydrogen. Atomic and physical properties, abundance, chemical properties. Deuterium and tritium. Production and uses. The Noble gases. (Group 18). Atomic and physical properties, distribution, chemical properties. Clatrates, ionic and covalent compounds. Production and uses.

2nd week:
Lecture: The halogens. (Group 17) Atomic and physical properties, distribution, chemical properties of the halogens. Interhalogens. Hydrogen halides, oxides and oxoacids. Structure and acidity of the oxoacids. Preparation and uses. The chalcogens. (Group 16). Atomic and physical properties, distribution, chemical properties of the chalcogens. Compounds with hydrogen and halogens. Water and softening of water. Oxides and oxoacids of chalcophylic elements. Sulphur-nitrogen compounds. Production and uses of the elements.

3rd week:
Lecture: Nitrogen, phosphorus, arsenic, antimony and bismuth (Group 15). Atomic and physical properties, distribution, chemical properties of the elements. Typical compounds, comparison of the stereochemistry of nitrogen and phosphorus. Hydrides, preparation and uses of ammonia. Structure, chemical properties of the oxides and oxoacids. Production and uses of the elements.

4th week:
Lecture: Carbon, silicon, germanium, tin and lead (Group 14). Atomic and physical properties, distribution, chemical properties of the elements. Chemistry of carbon and silicon. Typical compounds, the stereochemistry of carbon. Important compound of silicon. Oxides, oxoacids and related compounds. Carbon-nitrogen compounds, carbides. Production and uses of the elements.

5th week:
Lecture: Boron, aluminium, gallium, indium and thallium (Group 13). Atomic and physical properties, distribution, chemical properties of the elements. Structure and chemical properties of EX3 compounds. 3-centre bonding. Boron hydrides, binary and ternary hydrides of Al. Oxides and related compounds. Production and uses of the elements.

6th week:
Lecture: Introduction to qualitative analysis (This topic is partially worked up during the seminars). Short history of the analytical chemistry. Basic experimental methods in analytical chemistry. Classification of chemical reactions in analytical chemistry: acid-base, redox and complexation reactions, reactions with colour changes and precipitation. Specific, and selective reactions. Sensitivity. Preparation and homogeneity of the samples. Dissolution of solid samples. Classifications of the cations and anions based on inorganic chemical considerations. Types of sulphides. Tioacids, tiobasics and tiosalts. Introduction to coordination chemistry. Equilibria, stability correlations. Classifications of the complexes and ligands. Hard-soft theory and its application in analytical chemistry. Anions. Group 1. and 2: carbonate, bicarbonate, silicate, sulphide, poly-sulphide, sulphite, tiosulphate, hypoclorite; and borate, phosphate, sulphate, fluoride, bromate, iodate. Groups 3 and 4: chloride, bromide, iodide, cyanide, tiocyanide; and nitrite, nitrate, acetate, chlorate, perchlorate, peroxide.

7th week:
Lecture: Systematic analysis of cations. The Fresenius system. Reactions and separation of Group 1A and 1B cations: Ag(I), Pb(II), Hg(I), Cu(II), Hg(II), Bi(III), Cd(II). Reactions and separation of Group 2 cations (anions of semimetals): As(III), As(V), Sb(III) and Sb(V), Sn(II) and Sn(IV). Reactions and separation of Group 3 cations: Ni(II), Co(II), Fe(II), Fe(III), Mn(II), Cr(III), Al(III) and Zn(II). Reactions and separation of Group 4 cations: Ca(II), Sr(II) and Ba(II). Reactions of Group 5 cations: sodium -, potassium -, and lithium ions, Mg(II) and ammonium ions. Complete analysis of cations. Separation methods in the qualitative analysis.

8th week:
Lecture: S-block elements (Group 1 and 2): Atomic and physical properties, distribution, chemical properties and uses of the alkali and alkaline earth metals. Dissolution of Na in liquid ammonia. Covalent and coordination compound of the alkali metal elements. Crown ethers and cryptands. Compounds of alkaline earth metals: hydrides, halogenides, oxides, hydroxides, salts with strong acids, complexes. The Grignard reagent.

9th week:
Lecture: Transition metals (d-block elements, Group 3 -12): General trend in the d-block. Electronic structure, oxidation state, atomic and ionic size. Horizontal and vertical similarities in the d-block. Atomic and physical properties, distribution, chemical properties and uses of the transition metals. Compounds: hydrides, halogenides, oxides, hydroxides, salts with strong acids, complexes. Acid-base properties and redoxy reactions. Transition metal ions in aqueous solutions: hydrated cations, oxocations and oxoanions. Iso- and heteropolyacids. Organometallic compounds. Carbonyls.

10th week:
Lecture: Titanium, Zirconium and Hafnium. Atomic and physical properties, distribution, chemical properties and uses of the elements. Halogenids and oxides. TlCl4, TiO2, ZrO2. Vanadium, Niobium and Tantalum. Atomic and physical properties, distribution, chemical properties and uses of the elements. Halogenides as cluster compounds. Oxides and related compounds. Chromium, Molybdenum and Tungsten. Atomic and physical properties, distribution, chemical properties and uses of the elements. Halogenides and oxides. Iso and heteropolyacids. Some Cr(III) compounds. Manganese, Technetium and Rhenium. Atomic and physical properties, distribution, chemical properties and uses of the elements. Important compounds of manganese.

11th week:
Lecture: Iron, Cobalt and Nickel. Atomic and physical properties, distribution, chemical properties and uses of the elements. Production of iron and steel. Important inorganic and coordination compounds of the elements. Platinum metals (Ru, Rh, Pd, Os, Ir, Pt). Atomic and physical properties, distribution, chemical properties, production and uses of the elements. Important inorganic and coordination compounds of the elements. Copper, Silver and Gold. Atomic and physical properties, distribution, chemical properties and uses of the elements. Chemistry of photography. Zinc, Cadmium and Mercury. Atomic and physical properties, distribution, chemical properties, production and uses of the elements. Halogenides, oxides, sulphides and coordination compounds.

12th week:
Lecture: f-block elements. Electronic structure, the lanthanide contraction. Some important complexes of Gd. Important uranium compound related to the atomic energy industry.

13th week:
Lecture: Introduction to the bioinorganic chemistry. Essential and toxic elements in biologic systems. Classification of the biological functions of the essential elements. Complex forming properties of the biologically important ligands. Biological functions of the essential elements. Transport and activation of the small biomolecules. Metalloenzymes, metalloproteins. Important examples, enzyme models.

14th week:
Lecture: Biological functions of alkali and alkaline earth metal ions. Transition metals and other elements. Transport, storage and activation of oxygen. Role and metabolism of iron. Copper containing proteins and metabolism of copper. Biological role of zinc in activation of enzymes. Importance of Mo, Se and silicon. Medical applications: diagnosis and therapy. Toxicity of metal ions.

Requirements

Exam: written test

Department of Organic Chemistry

Subject: **ORGANIC CHEMISTRY PRACTICE I.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Seminar: **14**
Practical: **42**

1st week:
Seminar: Receiving of laboratory equipments, safety education. Crystallization from water and organic solvent. Controlling of purity by thin-layer chromatography (TLC), and determination of melting point. Filling in of laboratory notes.
Practical: Receiving of laboratory equipments, safety education. Crystallization from water and organic solvent. Controlling of purity by thin-layer chromatography (TLC), and determination of melting point. Filling in of laboratory notes.

2nd week:
Seminar: Isolation of nicotine from tobacco leaves. Isolation of piperine from black pepper. Vacuum and simple distillation. Filling in of laboratory notes.
Practical: Isolation of nicotine from tobacco leaves. Isolation of piperine from black pepper. Vacuum and simple distillation. Filling in of laboratory notes.

3rd week:
Seminar: Isolation of caffeine from tea leaves. Separation of organic compounds with liquid-liquid extraction. Filling in of laboratory notes.
Practical: Isolation of caffeine from tea leaves. Separation of organic compounds with liquid-liquid extraction. Filling in of laboratory notes.

4th week:
Seminar: Separation of acetanilide and m-dinitrobenzene by column chromatography. Identification of hydrocarbons. Filling in of laboratory notes.
Practical: Separation of acetanilide and m-dinitrobenzene by column chromatography. Identification of hydrocarbons. Filling in of laboratory notes.

5th week:
Seminar: Identification of organic halides. Preparation and purification of terc-butyl-chloride. Filling in of laboratory notes.
Practical: Identification of organic halides. Preparation and purification of terc-butyl-chloride. Filling in of laboratory notes. Deposite the laboratory equipments.

Requirements

Conditions on signing the lecture book: The laboratory work is evaluated by a five-level practical grade.

Prerequisite: General Chemistry Theory and Practice.
The Organic Chemistry Seminar and Laboratory Practice will be kept in three groups. Each group will exercise for 5 weeks.

Subject: **ORGANIC CHEMISTRY THEORY I.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: History of organic chemistry. Description of hetero- and homo-nuclear bonds of organic compounds.

2nd week:
Lecture: MO and VB theory of the chemical bond.

3rd week:
Lecture: Constitution, configuration and conformation of organic compounds, stereochemical definitions. Chirality, optical activity. Properties of optically active compounds. Classification of organic compounds and their nomenclature.

4th week:
Lecture: Classification of organic reaction. Reaction mechanism. Relationship between structure and physical properties.

5th week:
Lecture: Structure elucidation of organic compounds. Principles of spectroscopic methods.

6th week:
Lecture: Structure and isomerism of alkane-sand cycloalkanes. Steroids.
Self Control Test

7th week:
Lecture: Preparations and reactions of alkanes and cycloalkanes.

8th week:
Lecture: Characterization of alkenes, their reactions and preparations.

9th week:
Lecture: Characterization of dienes, polienes, allylic compounds and their reactions and preparations.

10th week:
Lecture: Characterization of alkynes, their preparations and reactions. Classification of aromatic compounds.

11th week:
Lecture: Definition of aromacity, reactions of aromatic compounds. Theory of aromatic electrophilic substitution.

12th week:
Lecture: Effect of susbstituent on electrophilic aromatic substitution.

13th week:
Lecture: Policyclic aromatic compounds.

14th week:
Lecture: Properties, synthesis and preparation of alkyl halides.

15th week:
Lecture: Nucleophilic substitution and elimination of alkyl halides.

Requirements

Lecture = terminal examination.

Department of Physical Chemistry /MTA-DE Homogeneous Catalysis and Reaction Mechanisms Research Group

Subject: **PHYSICAL CHEMISTRY I.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **30**
Seminar: **15**

1st week:
Lecture: Basic notions of thermodynamics. System, surroundings, state variables, state equation. Perfect and real gases. Open, closed and isolated systems. Homogeneous, inhomogeneous and heterogeneous systems. Homogeneous and heterogeneous mixtures. Phase space, path, state function, process quantity. Velocity and energy distributions of the gas molecules.
Seminar: Basic notions of thermodynamics. System, surroundings, state variables, state equation. Perfect and real gases. Open, closed and isolated systems. Homogeneous, inhomogeneous and heterogeneous systems. Homogeneous and heterogeneous mixtures. Phase space, path, state function, process quantity. Velocity and energy distributions of the gas molecules.

2nd week:
Lecture: First law of thermodynamics. Work, heat, internal energy, enthalpy. Conservation of energy, the first law. Heat capacities, special processes. Standard reaction enthalpy, standard enthalpy of formation, Hess theorem.
Seminar: First law of thermodynamics. Work, heat, internal energy, enthalpy. Conservation of energy, the first law. Heat capacities, special processes. Standard reaction enthalpy, standard enthalpy of formation, Hess theorem.

3rd week:
Lecture: The second and third laws of thermodynamics. Various formulations of the second law, the direction of natural processes, irreversibility. Entropy, potential functions, Gibbs and Helmholtz functions. Heat engines and refrigerators. The behaviour of substances at low temperatures, the unattainability of the absolute zero. Statistical mechanics aspects of the second and third laws.
Seminar: The second and third laws of thermodynamics. Various formulations of the second law, the direction of natural processes, irreversibility. Entropy, potential functions, Gibbs and Helmholtz functions. Heat engines and refrigerators. The behaviour of substances at low temperatures, the unattainability of the absolute zero. Statistical mechanics aspects of the second and third laws.

4th week:
Lecture: Phase equilibria of pure substances. Vaporization, fusion, sublimation and allotropic (polymorphic) transformations. The Clapeyron and Clausius–Clapeyron equations. Phase diagrams, Gibbs phase rule. Saturated vapour pressure of curved surfaces.
Seminar: Phase equilibria of pure substances. Vaporization, fusion, sublimation and allotropic (polymorphic) transformations. The Clapeyron and Clausius–Clapeyron equations. Phase diagrams, Gibbs phase rule. Saturated vapour pressure of curved surfaces.

5th week:
Lecture: Homogeneous mixtures 1. Ideal and

real mixtures, partial molar quantities, chemical potential. The activity. Raoult's and Henry's laws. Pressure and boiling point vs. composition diagrams for liquid mixtures and distillation.
Seminar: Homogeneous mixtures 1. Ideal and real mixtures, partial molar quantities, chemical potential. The activity. Raoult's and Henry's laws. Pressure and boiling point vs. composition diagrams for liquid mixtures and distillation.

6th week:
Lecture: Homogeneous mixtures 2. The temperature and pressure dependence of the activity of saturated solutions. Colligative properties. Freezing point vs. composition diagrams, partition equilibrium. Electrolyte solutions and their activity, the Debye—Hückel limiting law.
Seminar: Homogeneous mixtures 2. The temperature and pressure dependence of the activity of saturated solutions. Colligative properties. Freezing point vs. composition diagrams, partition equilibrium. Electrolyte solutions and their activity, the Debye—Hückel limiting law.

7th week:
Lecture: Chemical equilibrium. The minimum of Gibbs energy in reactive systems at constant pressure and temperature, reaction Gibbs energy, equilibrium constant. Temperature and pressure dependence of equilibrium constant. Le Chatelier--Braun principle. Heterogeneous and solution equilibria.
Seminar: Chemical equilibrium. The minimum of Gibbs energy in reactive systems at constant pressure and temperature, reaction Gibbs energy, equilibrium constant. Temperature and pressure dependence of equilibrium constant. Le Chatelier--Braun principle. Heterogeneous and solution equilibria.

8th week:
Lecture: Transport phenomena. Notion, temperature dependence and measurement of viscosity, Stokes formula. Notions of diffusion and convection, their fluxes and differential equations. Notion, flux and differential equation of heat conduction. Heat conduction in mixtures and solids. Other forms of heat propagation.
Seminar: Transport phenomena. Notion, temperature dependence and measurement of viscosity, Stokes formula. Notions of diffusion and convection, their fluxes and differential equations. Notion, flux and differential equation of heat conduction. Heat conduction in mixtures and solids. Other forms of heat propagation.

9th week:
Lecture: : Electrical conduction of electrolyte solutions. Conductivity and molar conductivity of electrolyte solutions, their concentration dependence. Kohlrausch law and law of independent migration of ions. Ionic movement in solutions, ionic mobility. Ostwald dilution law. Transference number.
Seminar:: Electrical conduction of electrolyte solutions. Conductivity and molar conductivity of electrolyte solutions, their concentration dependence. Kohlrausch law and law of independent migration of ions. Ionic movement in solutions, ionic mobility. Ostwald dilution law. Transference number.

10th week:
Lecture: Galvanic cells and electrodes. Structure and diagram of galvanic cells, cell reaction, cell potential, electromotive force. Thermodynamics of galvanic cells. Concentration cells. Liquid-liquid junction potentials. Electrode potential, types of electrodes.
Seminar: Galvanic cells and electrodes. Structure and diagram of galvanic cells, cell reaction, cell potential, electromotive force. Thermodynamics of galvanic cells. Concentration cells. Liquid-liquid junction potentials. Electrode potential, types of electrodes.

11th week:
Lecture: Electrolysis, practical galvanic cells and corrosion. Electrolysis, decomposition voltage, overpotential. Faraday laws. Practical galvanic cells, Leclanché cell, lead-acid cell. Corrosion, oxide layers, local galvanic cells, corrosion protection.
Seminar: Electrolysis, practical galvanic cells and corrosion. Electrolysis, decomposition

voltage, overpotential. Faraday laws. Practical galvanic cells, Leclanché cell, lead-acid cell. Corrosion, oxide layers, local galvanic cells, corrosion protection.

12th week:
Lecture: Measurement of temporal concentration changes. Reaction rate, rate equation, order, kinetic differential equations. Determination of the rate equation, integral and differential methods, half-life. Elementary reactions, molecularity, mechanism. Bodenstein (steady state) principle. Chain reactions, homogeneous and heterogeneous catalysis, enzyme reactions, Michaelis--Menten kinetics. Autocatalysis, oscillation.
Seminar: Measurement of temporal concentration changes. Reaction rate, rate equation, order, kinetic differential equations. Determination of the rate equation, integral and differential methods, half-life. Elementary reactions, molecularity, mechanism. Bodenstein (steady state) principle. Chain reactions, homogeneous and heterogeneous catalysis, enzyme reactions, Michaelis--Menten kinetics. Autocatalysis, oscillation.

13th week:
Lecture: Basic notions of photochemical and radiochemical reactions. Temperature dependence of the reaction rate, Arrhenius equation, collision theory, the principle of the activated complex theory. Reactions in liquid phase, cage effect, diffusion and energy controlled reactions.
Seminar: Basic notions of photochemical and radiochemical reactions. Temperature dependence of the reaction rate, Arrhenius equation, collision theory, the principle of the activated complex theory. Reactions in liquid phase, cage effect, diffusion and energy controlled reactions.

14th week:
Lecture: Structure of matter and chemical bonding. Elements of quantum mechanical description, particle-wave duality, uncertainty principle. Stationary Schrödinger equation, particle-in-a-box, atomic orbitals, MO and VB methods, molecular orbitals of di- and polyatomic molecules, HOMO, LUMO, bonds, hybridization
Seminar: Structure of matter and chemical bonding. Elements of quantum mechanical description, particle-wave duality, uncertainty principle. Stationary Schrödinger equation, particle-in-a-box, atomic orbitals, MO and VB methods, molecular orbitals of di- and polyatomic molecules, HOMO, LUMO, bonds, hybridization

15th week:
Lecture: Structural methods. Rotational, vibrational and electronic spectra, determination of bond length and force constants, normal modes, spectra as „fingertips". Raman spectra. Electron spectroscopy. Principle of X-ray, electron and neutron diffraction.
Seminar: Structural methods. Rotational, vibrational and electronic spectra, determination of bond length and force constants, normal modes, spectra as „fingertips". Raman spectra. Electron spectroscopy. Principle of X-ray, electron and neutron diffraction.

Requirements

The seminars are compulsory. The semester is closed with written examination. The examination contains theoretical material as well as problems from those solved in the seminars. The prerequisite of the examination is the successful completion of the seminars.

Division of Biophysics

Subject: **BIOPHYSICS**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **15**
Seminar: **13**
Practical: **16**

1st week:
Lecture: Introduction to the course. Generation and absorption of X-rays. X-ray contrast materials.

2nd week:
Lecture: Fluorescence spectroscopy, flurescence techniques.

3rd week:
Lecture: Lasers and their biomedical applications. Photodynamic therapy.
Practical: Introduction.

4th week:
Lecture: Optical and electron microscopy.
Practical: Practices are performed in subgroups of 4-5 students in a rotary system For subgroup assignment, please see your lab teacher. P1: Determination of diffusion constant P2: Computed tomography Measurement of nuclear radiation P3: Determination of diffusion constant P4: Refractrometry P5: Light microcopy Optical measurements

5th week:
Lecture: Ionizing radiations and their interaction with materials. Dosimetry, tissue effects, detection of radiation
Practical: Practices are performed in subgroups of 4-5 students in a rotary system.

6th week:
Lecture: Research, diagnostic and therapeutic application of stable and radioactive isotopes. Contrast materials, radipharmacons.
Practical: Practices are performed in subgroups of 4-5 students in a rotary system.

7th week:
Lecture: Medical imaging (CT, PET, SPECT, MRI).
Seminar: S1: Biostatistics. Probability theory. Set theory. Random events. Conditional probability, marginalization. Independent events.
Practical: Practices are performed in subgroups of 4-5 students in a rotary system.

8th week:
Lecture: Diffusion at the molecular level, statistical interpretation. Fick's 1st law. Thermodiffusion. Osmosis
Seminar: S2: Biostatistics. Random variable. Cummulative distribution function, distribution function of random variable. Mean, standard deviation.
Practical: Practices are performed in subgroups of 4-5 students in a rotary system.

9th week:
Lecture: Structure of biological membranes. Membrane transport.
Seminar: S3: Biostatistics. Discrete probability distributions: binomial and Poisson-distribution.
Practical: Spare lab

10th week:
Lecture: Origin of membrane potential Resting potential, action potential, electric excitbility.
Seminar: S4: Biostatistics. Continuous probability distribution. Normal distribution. Standard normal distribution. Sampling.
Practical: Practical exam.

11th week:
Lecture: Pharmacology of ion channels (gating, selectivity). Patch clamp technique.
Seminar: S5: Biostatistics. Hypothesis testing. Null hypothesis. Statistical significance. z-test.

12th week:
Lecture: Fluid mechanics, blood circulation. Newtonian fluids, viscosity, creams and emulsions.
Seminar: S6: Biostatistics. Paired, unpaired t-test, F-test.

13th week:
Lecture: Biophysics of drug delivery. Nanotechnology approaches.
Seminar: S: Biostatistics final test.

14th week:
Lecture: Methods of pharmacological research. Gelelectrophoresis, isoelectric focussing, blotting. Detecting molecular interactions (SPR, FCS, FRET)
Seminar: Biophysics: Consultation

15th week:
Lecture: Consultation. Preparation for the exam.

Requirements

Compulsory reading:
Medical Biophysics (Editors.: S. Damjanovich, J. Fidy, J. Szöllősi, Medicina, Budapest, 2009, ISBN: 978-963-226-127-0)
Educational material published on the web page of the Department. (lecture materials, description of lab practicals)

Condition for signing the lecture book
- All labs done (1 spare lab available for make-up)
- Lab exam attended (no make-up possible)
- Minimally 5 out of 6 biostatistics seminars attended (no make-up possible)
- Signing up for the electronic course PHARM-Biophys at the exam.unideb.hu website by the end of week 3 (the site can only be reached from inside the University network)
- Lectures are officially not compulsory, but heartily recommended

Exams and grading
- Lab exam (see the actual timetable) –10 points max
- Final exam in biostatistics (week 13) – 20 points max
- Exemption test (electronic) in biophysics (week 15), or written exam(electronic) in final exam - 70 points max
- Total: 100 points. Grades:
  - 50< pass (2)
  - 60< satisfactory (3)
  - 70< good (4)
  - 80< excellent (5)

- Please note that your work during the semester constitutes a compulsory part of your final score, which cannot be changed during the exam period, so take your studies seriously throughout the semester.

No exam course will be offered for this subject.

Repeaters
Those who have obtained a signature for the subject earlier are exempted from attending the labs and the biostatistics seminars.

Those exempted can chose to keep their scores from last year, or to take the exams together with the rest of the class during the semester. The decision has to be made before the end of the 3rd week of education, and the study advisor at biophysedu@med.unideb.hu notified about it. If you do not write, we automatically assume that you keep last year's score, and no changes to this will be possible. Biostatistics and Lab exemptions, scores, exams, etc are independent from each other.

CHAPTER 17
ACADEMIC PROGRAM FOR THE 2ND YEAR

Department of Colloid- and Environmental Chemistry

Subject: **COLLOID AND SURFACE CHEMISTRY PRACTICE**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **28**

8th week:
Practical: 1. Rheological characterization of concentrated emulsions (creams).

9th week:
Practical: 2. Measurement of surface tension of solutions by Du Nouy tensiometer.

10th week:
Practical: 3. Polymer's relative molecular masses from viscosity measurements.

11th week:
Practical: 4. Adsorption from solution.

12th week:
Practical: 5. Solubilization.

13th week:
Practical: 6. Determination of size distribution of a sedimenting suspension.

14th week:
Practical: 7. Experiments on thixotropic or other anomalous fluids with a rotation vis-cometer

15th week:
Practical: Supplementary practice, consultation, correction.

Requirements

Attendance on all practice is compulsory. Preparation of lab notebooks is necessary to get the signature. More detailed instructions will be given on the first lab course.

Subject: **COLLOID AND SURFACE CHEMISTRY THEORY**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **28**

1st week:
Lecture: "A": A subject of colloid and surface chemistry. Classification of the dispersed systems. Type of colloids. Typical everyday colloids. Preparation of colloids. The basic characteristics of colloid systems: dispersity, morphology, spatial distribution, interparticle interactions, normal distribution. Thermodynamic and kinetic stability.
"B": Molecular interactions. Attraction forces: ion-ion, ion-dipole, dipole-dipole, dispersion interactions. Hydrogen bonds, hydrophobic interactions.

2nd week:
Lecture: "A": Definition of energy of activation. Basic transport properties. Description of Brownianmotion, random walk. Diffusion coefficient, average distance. Einstein-Stokes equation. Sedimentation equation. Diffusion flux and diffusion equation. Measuring of size distribution with different techniques (osmosis,

diffusion, light scattering, Donnanpotential).
"B": Interfacial chemistry. Definition of interfacial region, types of interfaces. Surface tension. Surface tension depends on the intermolecular interactions. Determination of surface tension. Temperature dependence of surface tension. Spreading. Monomolecular films.

3rd week:
Lecture: "A": Curved interfaces. The effect of surface curvature on the vapor pressure of a liquid. Kelvin equation. Meniscus, contact angle, wetting, spreading. Hydrophilic, hydrophobic surfaces.
"B": Adsorption. Hardy-Harkins best continuity rule. Surface activity and inactivity. Gibbs isotherm equation. Monolayer and multilayers (Langmuir-Blodgett). Physical state of the monolayers. Application of monolayers. Film formation. Analysis, membrane modeling, water conservations, sensors. Vesicles, liposomes.

4th week:
Lecture: "A": Solid surfaces. Molecular structure and characterization. Adsorption at the gas-solid interface, adsorption isotherms. Type of isotherms. Langmuir, BET. Freundlich. Capillary condensation. Adsorption from solutions. Applications. Theory and types of chromatographies. Retention time.
"B": Association colloids. Amphipatic molecules. Surfactants, physical properties of solutions of surfactants. Micelles. CMC, dependence on chain length and salt concentration. The Krafftpoint. Detergency, chemistry of washing. Solubilization. Applications in medicine. Lung surfactants.

5th week:
Lecture: "A": Charged surfaces. Origin of surface charge, electrodes. Mulliken experiment, elementary charge. Electrical double layer models. Hemholtz, GouyChapman and Stern models. Zeta-potential. Reverse the sign of the zeta potential.
"B": Electrical double layer. Zeta-potential. Electrophoresis.

6th week:
Lecture: "A": Stability of dispersion colloids. Electrostatic theory: DLVO. Inter-particle forces. Hamakerequation. Hardy-Schulze rule. Stability ratio. Critical coagulation concentration. Applications of DLVO theory, Steric and electrostatic stabilization. Bridging flocculation. Depletion flocculation lyophilic colloids as sensitizer.
"B": Macromolecules. Definitions and types. Structures and sizes of polymers. Determination of size. Sorption of polymers. Bridging flocculation. Depletion flocculation lyophilic colloids as sensitizer. Targeted medicine.

7th week:
Lecture: "A": Emulsion. Emulsion types. Identification of emulsion type. Emulsion stability. Emulsifiers HLB (hydrophilic -lipophilic balance) values. Physical properties of emulsions. Breaking emulsions. Foam. Foam Stability. Inhibition and breaking of foam. Examples.
"B": Rheology. Theory and definition of viscosity. Rheological types of mat-ter. Share rate, basic equations. Viscosity- and rheometers. Viscosity of solutions of colloids. Response of matter for sharing typical cases. Structure of coherent systems. Gels, creams: thixotropy.

Requirements

Attendance on the lectures is highly recommended. The evaluation is based on the total score of a written test, 50% is necessary to pass. More detailed information will be presented on the first lecture.

Department of Foreign Languages

Subject: **HUNGARIAN LANGUAGE II/1.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Revision.

2nd week:
Practical: Pretest.

3rd week:
Practical: Unit 1

4th week:
Practical: Unit 2

5th week:
Practical: Unit 3

6th week:
Practical: Unit 4

7th week:
Practical: Unit 5

8th week:
Practical: Revision. Mid-term test.

9th week:
Practical: Unit 6

10th week:
Practical: Unit 7

11th week:
Practical: Unit 8

12th week:
Practical: Unit 9

13th week:
Practical: Unit 10

14th week:
Practical: Revision. End-term test.

15th week:
Practical: Oral minimum exam. Evaluation.

Requirements

Attendance

Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the final signature is refused and the student must repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.

Testing, evaluation

In each Hungarian language course, students must sit for 2 written language tests and a short minimal oral exam.
A further minimum requirement is the knowledge of 200 words per semester announced on the first

week. There is a (written or oral) word quiz in the first 5-10 minutes of the class, every week. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam that includes all 200 words along with the oral exam. The results of word quizzes are added to the average score of the written tests.
The oral exam consists of a role-play randomly chosen from a list of situations announced in the beginning of the course. Failing the oral exam results in failing the whole course. The result of the oral exam is added to the average of the mid-term and end-term tests.
Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60, the student once can take an oral remedial exam covering the whole semester's material.

Consultation classes:
In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.

Course book:
Audio files to the course book, oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Department of Inorganic and Analytical Chemistry

Subject: **PHARMACEUTICAL BIOCHEMISTRY I.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **40**
Practical: **5**

1st week:
Lecture: Introduction to Biochemistry. Molecular design of life. Amino acids. Peptides. Primary, secondary, tertiary, quaternary structures.
Practical: Kinetic studies on beta-glucosidase from sweet almond.

2nd week:
Lecture: Determination of peptide structures. Peptide synthesis. Denaturation. Methods for separation and structural determination. Protein structure and function. Oxygen transporting proteins: Myoglobin and Hemoglobin.

3rd week:
Lecture: Carbohydrates. Biological role of carbohydrates. Monosaccharides, disaccharides, polysaccharides. Glycoconjugates. Glycobiology.

4th week:
Lecture: Introduction to biological membranes. Lipids. Classification and functions of lipids. Neutral fats, oils and waxes. The major classes of membrane lipids. Membrane models.

5th week:
Lecture: Enzymes. Classification. Coenzymes. Mechanism of enzyme action. Control of enzyme activity.

6th week:
Lecture: The kinetic properties of enzymes. The Michaelis-Menten model. Graphic evaluation of the kinetic parameters. Inhibition of enzyme activity. Diagnostic importance of enzymes.

7th week:
Lecture: Metabolism: basic concepts and design. Metabolism of carbohydrates. Glycolysis. The fate of pyruvate. Entry of fructose and galactose into glycolysis. Gluconeogenesis. Cori cycle.

8th week:
Lecture: The pentose phosphate pathway. Glycogen metabolism. Glycogen degradation and synthesis. The coordinated control of synthesis and breakdown. Disease of glycogen storage.

9th week:
Lecture: Citric acid cycle. Pyruvate dehydrogenase complex. The citric acid cycle is a source of biosynthetic precursors. Control of the citric acid cycle. The glyoxylate cycle.

10th week:
Lecture: Oxidative phosphorylation. The three enzyme complexes of the respiratory chain. Synthesis of ATP. The ATP yield of the complete oxidation of glucose.

11th week:
Lecture: Fatty acid metabolism. Oxidation of fatty acids and unsaturated fatty acids. Energetics of fatty acid oxidation. Synthesis of ketone bodies.

12th week:
Lecture: Biosynthesis of fatty acids. The elongation cycle. Biosynthesis of cholesterol. Clinical aspects. Obesity.

13th week:
Lecture: Digestion of proteins. Amino acid degradation. Transamination and oxidative deamination. The urea cycle. The link between the urea and the citric acid cycle. The fates of the carbon skeletons of amino acids. Disorders of amino acid metabolism.

14th week:
Lecture: DNA and RNA: Molecules of heredity. Purine and pyrimidine bases, nucleosides and nucleotides. cAMP, ATP. Nucleotid coenzymes.

15th week:
Lecture: Digestion of nucleic acids Catabolism of purines and pirimidines. Disorders in the metabolism. One-carbon groups carried by tetrahydrofolate. Biological methylations.
Practical: Kinetic studies on ✓-glucosidase from sweet almond.

Requirements

Detailed instructions will be given on the first lecture.

Subject: **QUANTITATIVE ANALYTICAL CHEMISTRY THEORY I.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **45**
Seminar: **15**

1st week:
Lecture: Introduction: Analytical chemistry and its objectives. The analytical process. Measurements. Equilibria in solution and their quantitative analytical applications.
Seminar: Calculations in acid-base systems: Simple problems about pH calculations (revision). Quantitative description of solutions containing monobasic acids and bases. Buffers in acid-base chemistry.

2nd week:
Lecture: Acid-base equilibria (based on Brönsted-Lowry theory). Basic concepts: bases, acids, ampholytes, self-dissociation, base strength, acid strength, dissociation constant, association constant, pH calculations: pH of strong acids and strong bases, weak acids, weak bases and buffers, pH of polyprotic acids and bases, overlapping parallel acid-base equilibria: macro- and micro constants.
Seminar: Calculations in acid-base systems: Simple problems about pH calculations (revision). Quantitative description of solutions containing monobasic acids and bases. Buffers in acid-base chemistry.

3rd week:
Lecture: Acidimetric and alkalimetric titrations: titration curves and their calculations, factors influencing the shape of the titration curves, end-point, equivalence point, methods of endpoint indication (Gran function and its applications). Applications of acid-base titrations.
Seminar: Di- and polybasic acids and bases, ampholytes (illustration with evaluating the titration curve of a sample of phosphoric acid). Problems based on acid-base titrations. Calculation of equivalence points, indicator selection. Calculations for planning titration-based methods, calculation of final results from experimental data.

4th week:
Lecture: Complex formation equilibria. Basic concepts: stepwise equilibrium, equilibrium constants, concentration distribution curves, simultaneous equilibria influencing complexometric reactions, conditional stability constant, chelate effect.
Seminar: Di- and polybasic acids and bases, ampholytes (illustration with evaluating the titration curve of a sample of phosphoric acid). Problems based on acid-base titrations. Calculation of equivalence points, indicator selection. Calculations for planning titration-based methods, calculation of final results from experimental data.

5th week:
Lecture: Complexometric titrations: titration curves and their calculations, factors influencing the shape of the titration curves, indication in complexometry, selective complex formation reactions. Applications of complexometric titrations.
Seminar: Di- and polybasic acids and bases, ampholytes (illustration with evaluating the titration curve of a sample of phosphoric acid). Problems based on acid-base titrations. Calculation of equivalence points, indicator selection. Calculations for planning titration-based methods, calculation of final results from experimental data.

6th week:
Lecture: Precipitation equilibria: Basic concepts: solubility, solubility product, factors influencing the solubility (the common ion effect, temperature effect, solvent effect, effects of simultaneous solution equilibria: protonation/hydrolysis or complex formation). Titration based on precipitate formation: titration curves and their calculations, shape of titration

curves, endpoint indication. Practical applications (argentometry).
Seminar: Practice, consultation.

7th week:
Lecture: Equilibria of redox systems: Basic concepts: redox potential, Nernst equation, equilibrium redox potential, equilibrium constant and redox potential, factors influencing the redox potential. Redox titrations (oxidimetry, reductometry): titration curves and their calculations, shape of titration curves, practical applications (permanganometry, chromatometry, bromatometry, iodometry).
Seminar: Test I.

8th week:
Lecture: Methods of analytical separation. Basic concepts: distribution constant, distribution coefficient, separation factor. Separation methods with phase transition. Theory and practice of gravimetry. Extraction methods: liquid-liquid, solid-liquid extraction, distillation. pH dependence of solute partitioning processes. Determination of metal ions by extraction.
Seminar: Complex formation equilibria. The concept and calculation of conditional stability constants. Calculations connected to complexometric titration methods.

9th week:
Lecture: Chromatographic methods: Basic concepts: classification, separation techniques, chromatographic process (HETP, number of theoretical plates, basic equation of chromatography, peak broadening, van Deemter equation, resolution and its optimization), characteristic values of a chromatogram (retention parameters, quantitative evaluation methods).
Seminar: Complex formation equilibria. The concept and calculation of conditional stability constants. Calculations connected to complexometric titration methods.

10th week:
Lecture: Gas chromatography: components of a gas chromatograph, detectors, role of temperature in gas chromatography, practical applications. Liquid chromatography: modules of a liquid chromatograph, detectors. Electrophoresis: slab gel electrophoresis and capillary electrophoresis.
Seminar: Quantitative description of redox equilibria. Calculations based on redox titration methods.

11th week:
Lecture: Basic concepts: signal, noise, sensitivity, limit of detection, reproducibility, accuracy, precision, calibration, signal to noise ratio, basics of error calculation. Discarding questionable data points. Q-test, t-test. GLP, GMP.
Seminar: Quantitative description of redox equilibria. Calculations based on redox titration methods.

12th week:
Lecture: Spectroscopic methods: Origin of spectrum. Classification of spectroscopic methods. Molecular spectroscopy, UV-VIS. Analytical applications of fluorescence and phosphorescence. Lambert-Beer law.Construction of spectrometers, detectors, monochromators. Applications of spectrophotometry.
Seminar: Quantitative description of precipitation equilibria. Solubility product and solubility. Effects of pH and the excess of precipitating ion on solubility. Problems based on precipitation reactions and precipitation-based titrimetric methods.

13th week:
Lecture: Atomic spectroscopic methods. Atomic spectrum, spectral lines. Atomization, ionization. Construction of the atomic spectrometers. Sample introduction. Flame atomic absorption spectrometry (FAAS), graphite furnace AAS. ICP, ICP-MS Interferences in atomic spectrometry. Speciation analysis.
Seminar: Quantitative description of precipitation equilibria. Solubility product and solubility. Effects of pH and the excess of precipitating ion on solubility. Problems based on precipitation reactions and precipitation-based titrimetric methods.

14th week:
Lecture: Fundamentals of electrochemistry. Analytical applications of the interaction between electric current and matter. Potentiometry. Glass electrode. Reference and indicator electrodes.
Seminar: Practice, consultation.

15th week:
Lecture: Direct potentiometry. Potentiometric titration Field effect transistors as chemical sensorsConductometry. Direct and indirect conductometry.
Seminar: Test II.

Requirements

Minimum requirements: The sum of scores from the two tests must be at least 41 points out of 100 to pass, otherwise test III must be taken or a short pre-exam admission test must be written before beginning the main exam in Quantitative analytical chemistry I. A sum of scores for the two tests of at least 85 % guarantees an improvement of +1 on exam grades except for a 'fail' grade.

Department of Organic Chemistry

Subject: **ORGANIC CHEMISTRY PRACTICE II.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Receiving of laboratory equipments. Safety educations. Repetition: crystallization from methanol and water, filtration, TLC, determination of melting point.

2nd week:
Practical: Isolation of Carvone from caraway. Steam distillation. Separation of benzoic acid and benzanilide by liquid-liquid extraction.

3rd week:
Practical: Identification of hydroxyl derivatives of hydrocarbons. Test tubes reaction. Identification of unknown compounds.

4th week:
Practical: Preparation of 1,3-Dinitrobenzene. Preparation of iodoform.

5th week:
Practical: Preparation of benztriazol. Preparation of 3-nitroaniline.

6th week:
Practical: Identification of amino derivatives of hydrocarbons. Identification of unknown compounds.

7th week:
Practical: Identification of oxo derivatives of hydrocarbons. Identification of unknown compounds. Preparation of cyclohexanone-2,4-dinitrophenylhidrazone.

8th week:
Practical: Preparation of Benzoic acid and N-benzoyl-glycine.

9th week:
Practical: Preparation of 2,3-diphenyl-quinoxaline and 2,6-dibenzylidene-cyclohexanone.

10th week:
Practical: Isolation and saponification of the glyceride of nutmeg.

11th week:
Practical: Test tube reactions of carbohydrates. Identification of amino acids.

12th week:
Practical: Test tube reaction of amino acids and proteins.

13th week:
Practical: Complex test: Identification of unknown compounds.

14th week:
Practical: Preparation of O-Acetyl-salicylic acid, complex chromatography.

15th week:
Practical: Deposit the laboratory equipments. Assessment of laboratory.

Requirements

Compulsory literature: The hand-out provided by the leader of the laboratory practice.

Suggested Reading: The hand-out of the lecture of organic chemistry II as well as its compulsory and suggested literature.

Conditions on signing the lecture book: The laboratory work is evaluated by a five-level practical grade.

Subject: **ORGANIC CHEMISTRY THEORY II.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: Classifications and bond structure of alcohols, phenols and ethers. Preparation of alcohols, ethers and their thio analogues.

2nd week:
Lecture: Reactions of alcohols, ethers and their thio analogues.

3rd week:
Lecture: Preparations and reactions of phenols and their thio analogues.

4th week:
Lecture: Characterization, reactions and preparations of amines.

5th week:
Lecture: Preparations and reactions of nitro, diazo derivatives and diazonium salts.

6th week:
Lecture: Reactions and preparations of aldehydes, ketones and dioxo derivatives. Nucleophilic addition-elimination reactions.

7th week:
Lecture: Classification, description and reactivity of mono- and dicarboxylic acids and their derivatives.

8th week:
Lecture: Nucleophilic substitution on acyl carbon, preparation and transformation of carboxylic acid and its derivatives.

9th week:
Lecture: Characterization, reactions and preparations of amino acid. Structure of peptides and proteins.

10th week:
Lecture: Structure elucidation of proteins, peptide synthesis. Characterization and structures of carbohydrates, mono-, di- and polisaccharides.

11th week:
Lecture: Reactions of carbohydrates, synthesis of di- and polisaccharides.

12th week:
Lecture: Heterocyclic compounds, heteroaromatic systems. Three-, four- and five-membered heterocycles with one heteroatom. ÃŸ-lactam antibiotics.

13th week:
Lecture: Compounds with porphyrin skeleton. Five-and six-membered ring systems with two or more heteroatoms.

14th week:
Lecture: Characterization and importance of heterocyclic natural products. Alkaloids. Flavonoids and vitamins.

15th week:
Lecture: Nucleosides, structures, preparations and transformations of nucleotides and nucleic acids.

Requirements

Terminal examination, comprehensive examination.

Department of Physical Chemistry /MTA-DE Homogeneous Catalysis and Reaction Mechanisms Research Group

Subject: **PHYSICAL CHEMISTRY II.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **45**

1st week:
Practical: Introduction, general information and safety training (1 hr).

2nd week:
Practical: One of the following topics: Measuring densities by pycnometer, composition of a binary mixture. Measuring electrical conductivity of solutions.

3rd week:
Practical: One of the following topics: Measuring the concentration of a coloured solute by spectrophotometry. Determination of NaHCO3 content of a solid sample by gas volumetry.

4th week:
Practical: One of the following topics: pH-metric titration curves of hydrochloric and acetic acids. Study of electrolysis.

5th week:
Practical: One of the following topics: Mutarotation of glucose measured by polarimetry. Measuring electromotive force of a galvanic cell.

6th week:
Practical: One of the following topics: Reaction rate of decomposition of H2O2 measured by gas volumetry. Investigation of buffers.

7th week:
Practical: One of the following topics:

Distillation of an alcohol-water mixture. Determination of heat capacity of metals.

8th week:
Practical: One of the following topics: Thermodynamic quantities by measuring the temperature dependent EMF. Determination of partial molar volumes by measuring densities.

9th week:
Practical: One of the following topics: Redox potentials from potentiometric titrations. Determination of activity coefficient for concentration galvanic cell.

10th week:
Practical: One of the following topics: Study of the iodine-iodide triiodide equilibrium. Dissociation constant of weak acids measured by conductometry.

11th week:
Practical: One of the following topics: Dissociation equilibria of ampholites, determination of isoelectric pH.Acid catalysed hydrolyis of saccharose.

12th week:
Practical: One of the following topics: Kinetics of a second order reaction: hydrolysis of esters.Initial rates and activation energy of the iodine clock.

Requirements

The measurements and knowledge of the associated theory are graded and an overall mark will be given.
Safety training (1st week) is mandatory before the first lab practice (2nd week).
Everybody should work individually according to the pre-set schedule (it will be provided on the 1st week).
Lab practices are 4-hr long every week (from the 2nd until the 12th weeks)
In accordance with the regulations of University of Debrecen, attendance is compulsory with the exception of health or family problems. In this case, the students should agree with the teacher on replacement dates for the missed experiments.

Department of Physiology

Subject: **HUMAN PHYSIOLOGY I.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **30**
Seminar: **15**

1st week:
Lecture: Introduction
Passive and active transport
Resting membrane potential

2nd week:
Lecture: Ion channels
The mechanism of action potential
Basic receptor functions

3rd week:
Lecture: Cardiac action potential
ECG
Excitation-contraction coupling in cardiac muscle

4th week:
Lecture: Contractile properties of the heart

The cardiac output and the cardiac cycle
Humoral and the autonomic control of cardiac function

5th week:
Lecture: Physiology of synapse and neuromuscular junction
Skeletal muscle
Smooth muscle

6th week:
Lecture: Test I.

7th week:
Lecture: Physiology of the body fluids, red blood cells
Blood types, plasma, hemostasis, jaundice

8th week:
Lecture: General properties of circulation
Arterial circulation
Microcirculation, venous circulation

9th week:
Lecture: Cardiovascular reflexes
Humoral control of cardiovascular function
Central control of cardiovascular function

10th week:
Lecture: Cerebral- and coronary circulation
Splanchnic, cutaneous and muscular circulation
Cardiovascular shock

11th week:
Lecture: Pulmonary circulation
Mechanics of respiration
Compliance, work of breathing

12th week:
Lecture: Gas transport in the blood
Central control of breathing

13th week:
Lecture: Test II.

Requirements

1. Signature of Lecture Book
Attendance of the lectures and seminars are compulsory. The signature of the Lecture Book may be refused for the semester if one has more than four absences from the seminars. Every student must attend seminars with the group appointed by the Educational Office. For continuous updates on all education-related matters, please consult with the departmental web-site (http://phys.dote.hu).

The program of the Human Physiology I lectures is listed at the web site of the Department of Physiology (http://phys.dote.hu)

2. Evaluation during the semester (mid-semester tests)
The knowledge of students will be tested 2 times during the semester in the form of a written test (multiple choice questions). Participation on mid-semester written tests is compulsory.

3. Examination
The first semester is closed by an end-semester exam (ESE) covering the topics of all lectures and seminars of the semester. The A and B chances of the **end-semester exams** are written tests (multiple choice questions), while the C chance is an oral exam. The grade of the written test is calculated according to the following table:

Score	Grade
0 – 59.9 %:	fail
60 – 69.9 %	pass
70 – 79.9 %	satisfactory
80 – 89.9 %	good
90 – 100 %	excellent

- Students may receive exemption for ESE if the average score of the two mid-semester tests is above 60%, and (s)he has fewer than 6 and 5 lecture and seminar absences, respectively. In this case, the grade based on the average score will be offered(see the table above).

- The student can refuse to accept the grade based on the mid-semester tests and choose to take ESE.

Division of Pharmacognosy

Subject: **BOTANY PRACTICE**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Structure of plant cells, Diagnostic plant cell constituents, Inclusions, Vacuoles, Staining plant cells (Neutral Red, Lugol Solution etc.), Plasmolysis of plant cells, Preparation of your own microscopic samples.

2nd week:
Practical: Epidermis studies, Stomata, Primary and secondary epidermis, Digitalis purpureae folium, Salviae folium, Absinthi folium, Altheae folium, Thymi folium, Types of ti-chomes in Lamiaceae. Frangulae cortex, Analysis of Periderms and lenticels. Studying of Parenchymas and Collenchymas, Salep tuber, Calami Rhysoma, Marrubi herba, Capsici fructus, Cydonae fructus, Foeniculi fructus, Auranti pericarpium.

3rd week:
Practical: Studies on vascular tissues, Xylem - Tracheas, Tracheides, Xylemparenchymas, Fiber cells, Types of thickening, Phloem - Sieve cells, Sieve tubes, Sieve plates, Companion cells, Albuminous cells, Types of Vascular Bundles, Veratri radix, Agrimo-niae herba, Calami rhizoma, Belladonae folium, Filicis maris rhyzoma.

4th week:
Practical: Tissues of Primary and Secondary Roots, Veratri radix, Valerianae radix, Primulae radix, Liquiritiae radix, Saponariae albae readix, Belladonae radix, Gentianae radix, Altheae radix.

5th week:
Practical: Tissues of Secondary roots, Ipecacuanhae radix, Ononidis radix, Ratanhiae radix, Tissues of rhizomes, Graminis rhizoma,Veratri rhizoma, Rhei rhizoma.

6th week:
Practical: Tissues of Stems (Monocotyledonopsida, Dicotyledonopsida), Characterization of Cortex, Agrimoniae herba, Stem of Equisetum arvense, Chinae cortex, Frangula cortex, Cinnamoni cassiae Cinnamon ceylonici cortex, Quercus cortex.

7th week:
Practical: Tissues of leaves, Sennae folium, Absinthi folium, Uvae ursi folium, Belladonae

folium, Stramonii folium, Hyoscyami folium, Calciumoxalate inclusions.

8th week:
Practical: Fruit studies, Foeniculi fructus, Carvi fructus, Anisi vulgaris fryctus, ConiAuranti pericarpium,i fructus, Coriandri fructus, Juniperus galbulus, Fruits of Apiaceae.

9th week:
Practical: Seed studies, Tisseus of seeds, Lini semen, Strophanti semen, Sinapis nigrae semen, Strychni semen, Myrysticae semen, Stereomicroscopic studies on seeds, Identifying characters of drugs.

10th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Dicotyledonopsida, Ranunculaceae, Helleboraceae, Papaveraceae, Fumariaceae.

11th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Rosaceae, Fabaceae, Apiaceae, Brassicaceae.

12th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Apocyneceae, Rubiaceae, Boraginaceae,

13th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Lamiaceae, Solanaceae, Scrophulariaceae, Asteraceae.

14th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Monocotyledonopsida, Liliaceae, Poaceae.

15th week:
Practical: Oral and written test.

Requirements

Detailed information is given in the first practical course.

Subject: **BOTANY THEORY**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: History of pharmaceutical botany and pharmaceutical plant science. Anatomy, structure, function and metabolism of plant cells. Basic plant cell types, function of plant organelles.

2nd week:
Lecture: Anatomy of plant tissues, Meristems, Parenchymas, Collenchymas, Sclerenchymas, Epidermis (types of stomata), Vascular tissues, Ground tissues, Secretory tissues.

3rd week:
Lecture: Primary and Secondary plant body, Tissues of the Root and Stem, Xylem and Phloem, Function of Vascular Cambium. Organs Organizations of Root and Stem systems.

4th week:
Lecture: Primary and Secondary plant body, Tissues of Leaves and Reproductive Organs

(anatomy of flowers), Organization of Leaves and Reproductive Organs, Plant Life Cycle, Gametophyte and Sporophyte, Sexual Reproduction of Plants, Double Fertilization and Pollination of Plants.

5th week:
Lecture: Inflorescens. Fruit Types (true and accessory fruits) and Seed Dispersal. Plant Embryo and Seed Anatomy, Development of Seeds, Types of Seedlings.

6th week:
Lecture: Classification and Systematic of Plants, Historical Aspects of Plant Classification, Artificial- versus Natural System of Classification, Levels of Taxonomic Categories, Phenetic, Numeric- and Applied Taxonomy.

7th week:
Lecture: Kingdoms of Living Creatures, Cyanobacteria, Algae and Origin of Eukaryotes, Endosymbiont Theory, Embryophyta, Cormophyta and Spermatophyta Plants, (Mosses, Liverworts and Hornworts, Lychenophyta, Pteridophyta, Gymnospermatophyta, Angiospermatophyta).

8th week:
Lecture: Characterization of Gymnospermatophyta Plants and Pharmaceutically Important Taxa and Species Characterization of Angiospermatophyta Plants and Pharmaceutically Important Taxa and Species of the Taxon, Dicotyledonopsida, Orders and Families of Magnoliidae and Pharmaceutically Important Species of the Taxa.

10th week:
Lecture: Monocotyledonopsida, Orders and Families of Liliidae and Pharmaceutically Important Species.

11th week:
Lecture: Monocotyledonopsida, Orders and Families of Commelidinae and Pharmaceutically Important Species of the Taxa.

12th week:
Lecture: Dicotyledonopsida, Orders and Families of Hamamelididae and Pharmaceutically Important Species of the Taxa.

13th week:
Lecture: Dicotyledonopsida, Orders and Families of Dilleniidae and Pharmaceutically Important Species of the Taxa.

14th week:
Lecture: Dicotyledonopsida, Orders and Families of Rosoidae and Pharmaceutically Important Species of the Taxa.

15th week:
Lecture: Dicotyledonopsida, Orders and Families of Asteridae and Pharmaceutically Important Species of the Taxa.

Requirements

Detailed information is given in the first lecture.

Department of Biochemistry and Molecular Biology

Subject: **PHARMACEUTICAL BIOCHEMISTRY II.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **40**
Practical: **5**

1st week:
Lecture: Biochemistry of nutrition. Energy requirement. Basic metabolic rate. Energy content of the food. Energy storage and thermogenesis. Biochemical mechanism of obesity. Protein as N and energy source. N balance. Essential amino acids. Protein malnutrition. Vegetarianism. Clinical aspects of protein nutrition. Carbohydrates and lipids. Vitamins. Structure, biochemical functions. Relationship between the biochemical functions and the symptoms of deficiency. Essential inorganic elements of the food (metabolism, function, deficiency).

2nd week:
Lecture: Medical importance of the lipid metabolism. Organization of lipid structures. Mixed micelles in the digestive tract. Lipoproteins in blood plasma. Synthesis of cholesterol Cholesterol transport in the body. The LDL receptor and its gene. Excretion of cholesterol.Biochemical explanation of elevated blood cholesterol levels. Biochemical explanation of obesity.

3rd week:
Lecture: Genomics. Levels of eucariotic gene expression. The active chromatin. Regulation of transcription. Regulation at the mRNA level. Translational regulation. Posttransational events. Gene therapy.

4th week:
Lecture: Biochemistry of cell proliferation. Mitotic cascade. M-phase kinase. Products and biochemical function of protooncogenes. Mechanism of oncogene formation. Tumor suppressor genes and their biochemical function. Biochemical features of terminal differentiation. Biochemistry of programmed cell death.

5th week:
Lecture: Signal transduction I. Term and levels of regulation. Term and levels of regulation. Significance and interrelationship between metabolic, cytokine, hormonal and neuronal regulation. Forms of external signals. Receptors and transducers. Systems increasing the sensitivity of regulation: allosteria, substrate cycle, interconversion cycle, cascades.

6th week:
Lecture: Signal transduction II. Signalling pathways of nonpenetrating signals. Ionchannel receptors. Seven transmembrane domain receptors G proteins and GTP-ases. The adenylate cyclase and the phospholipase C signalling pathway.G proteins and GTP-ases. The adenylate cyclase and the phospholipase C signalling pathway. Control of enzyme activity. The NO system. Nuclear receptors.

7th week:
Lecture: Steroid hormones. Vitamin D. Stress. Stress proteins and enzymes in eukariotic cells. Heat shock proteins and their functions under normal circumstances. Hsp 70 and hsp 60 protein families. Role of chaperones and chaperonins. Thermotolerance of the cell. Hsp 90 protein family and their role in the cells. Transcriptional regulation of heat shock genes. Stress signals.

8th week:
Self Control Test

9th week:
Lecture: Hemoglobin. Biochemistry of the liver I. Hemoglobin; structure, function and regulation. Pathological forms of hemoglobin. Comparison of hemoglobin and mioglobin, regulation of oxygen binding. Biochemistry of

the liver.

10th week:
Lecture: Biochemistry of the liver II. Biotransformation. Biochemical consequences of ethanol consumption.

11th week:
Lecture: Biochemistry of blood clotting I. Cellular, humoral and vascular aspects of blood clotting. Structure, activation, adhesion and aggregation of thrombocytes. Classification of blood clotting factors and their role. Factors depending on vitamin K.

12th week:
Lecture: Biochemistry of blood clotting II., Iron metabolism. Contact phase of blood coagulation. Blood clotting in the test tube and in the body. Classification of blood coagulation. Role of thrombocytes and the vascular endothel. Limiting factors, inhibitors and activators of blood coagulation. Fibrinolysis. Iron transport, storage and distribution in the human body. Molecular regulation of the iron level in cells: stability of transferrin receptor and ferritin mRNA, IRE binding protein. Risk of the free iron and intracellular hemolysis.

13th week:
Lecture: Hem. Extracellular matrix. Uroporphynoids, hem-proteins. Synthesis of hem, regulation of the synthesis in eukariotic cells. Degradation of hem: formation, conjugation and excretion of bile pigments. Hem oxygenase. Disorders in hem metabolism. Biochemistry of the extracellular matrix: function and components. Glucosaminoglycans and proteoglycans. Collagens: structure, function and genetic origin.

14th week:
Lecture: Biochemistry of the sport.Biochemistry of the cytoskeleton. Proteins of myofibrils. Molecular mechanism for the generation of force. Metabolic fuel of muscle. Metabolism of muscle in various work load. Effect of exercise.practice: Biotransformation.
Practical: Enzymes of biotransformation.

Requirements

Requirements for signing the semester: attendance in laboratory practice

Attendance on the **lectures** is not compulsory, but recommended: in case of two lecture absences, all points collected during the semester are erased. Please arrive in time for the lectures, because the door of the lecture hall will be closed at the beginning of the lectures. Repeaters can collect bonus points without visiting the lectures (if they attend on them previously).

There will be two written **control tests** during the semester, by which 2x50 points (max. 100 points) can be collected. Each control test consist of 20 test questions from the material of the lectures, each good answer worth 2,5 points.

According to the result of the control tests, students can collect bonus points: those students who reaches at least 50 points will get 5 bonus points, those who reaches 70 points will get 10 bonus points. Bonus points will be added to the result of the final written exam. Control tests are not obligatory.

There is one **practice** in this semester, on the 14th week, it is obligatory for every student. Those students, who don't attend the practice, can't get signature for the semester. Practices are not obligatory for repeaters (if they did it previously).

The final „A", „B" and „C" **exams** are written exams. On the exam 100 points can be collected by 40 test questions from the material of the Pharmaceutical Biochemistry lectures. Each good answer worth 2.5 points. Bonus points collected by the control tests during the semester will be added to this result.

60 % (60 points) is needed to get a passing mark, and the grade increases with every 10 points:

60-67.5	pass
70-77.5	satisfactory
80-87.5	good
90-110	excellent

If a student fails the written „C" exam, department provides him/her a chance to provide his/her knowledge in an oral exam, in front of an examination committee. If the student passes this oral exam, he/she will be given a grade 2 (pass). The department will provide one examination date per week during the exam period.
Improvement exam: One improvement exam can be taken during the exam period. We always count the better grade of the taken exams.
Please follow the announcements of the department on the announcement table (LSB downstairs), and on the website (http://bmbi.med.unideb.hu, username: student, password: student2016).

Department of Foreign Languages

Subject: **HUNGARIAN LANGUAGE II/2.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Revision.

2nd week:
Practical: Pretest.

3rd week:
Practical: Unit 11

4th week:
Practical: Unit 13

5th week:
Practical: Unit 13

6th week:
Practical: Unit 14/1

7th week:
Practical: Unit 14

8th week:
Practical: Revision. Mid-term test

9th week:
Practical: Unit 15

10th week:
Practical: Unit 15

11th week:
Practical: Unit 16

12th week:
Practical: Unit 16

13th week:
Practical: Unit 16

14th week:
Practical: Revision. End-term test.

15th week:
Practical: Oral minimum exam. Evaluation.

Requirements

Attendance
Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the final signature is refused and the student must repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.

Testing, evaluation
In each Hungarian language course, students must sit for 2 written language tests and a short minimal oral exam.
A further minimum requirement is the knowledge of 200 words per semester announced on the first week. There is a (written or oral) word quiz in the first 5-10 minutes of the class, every week. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam that includes all 200 words along with the oral exam. The results of word quizzes are added to the average score of the written tests.
The oral exam consists of a role-play randomly chosen from a list of situations announced in the beginning of the course. Failing the oral exam results in failing the whole course. The result of the oral exam is added to the average of the mid-term and end-term tests.

Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60, the student once can take an oral remedial exam covering the whole semester's material.

Consultation classes: In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.

Course book: See the website of the department.

Website: Audio files to the course book, oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Department of Inorganic and Analytical Chemistry

Subject: **QUANTITATIVE ANALYTICAL CHEMISTRY PRACTICE II.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **75**

1st week:
Practical: Introduction to the Quantitave Analytical Chemistry Laboratory. Laboratory Safety Information. Preparation of 0.1 mol/dm3 HCl titrant (250 cm3)Review of lab equipment.

2nd week:
Practical: Determination of the exact concentration of the HCl titrant solution using KHCO3 stock solution. Determination of HgO in a HgO-KCl mixture (unknown sample). Preparation of 0.1 mol/dm3 NaOH titrant by the Sörensen (500 cm3) and determination of its exact concentration. Determination of oxalic acid (unknown sample).

3rd week:
Practical: Simultaneous determination of sulfuric acid and boric acid in a mixture (unknown sample). Preaparation of filters for the gravimetric determination Ca(II) as Ca(COO)2 precipitate. Preparation of 0.02 mol/dm3 KMnO4 titrant (250 cm3).

4th week:
Practical: Preparation of 0.05 mol/dm3 Na2(COO)2 stock solution (100.00 cm3).Determination of the exact concentration of the KMnO4 titrant solution using Na2(COO)2 stock solution. Determination of ferrous oxalate by permanganometric titration (unknown sample). Determination of hydrogen peroxide (unknown sample).Ca(II) as Ca(COO)2 precipitate (precipitation, filtration).

5th week:
Practical: Preparation of 0.02 mol/dm3 Na2S2O3 titrant (250 cm3) and determination of its exact concentration using 0.003 mol/dm3 KIO3 stock solution. Determination of copper(II) (unknown sample).Determination of iodide ion (unknown sample).Final results form the determination of Ca(II) by gravimetry (unknown sample).

6th week:
Practical: Preparation of 0.02 mol/dm3 KBrO3 titrant (250.00 cm3).Determination of ascorbic acid active ingredient content of vitamin C tablet (unknown sample).Determination of the composition of KCl-KBr mixture using 0.05 mol/dm3 AgNO3 stock solution (unknown sample).

7th week:
Practical: Preparation of 0.01mol/dm3 Na2EDTA titrant solution (250.00 cm3).Simultaneous determination of Ca2+ and Mg2+ ions (unknown sample).Determination of Al(III) (unknown sample).Lab equipment return.

8th week:
Practical: (8th - 13th weeks' topic) Instrumental analysis part: practice of ICP, atomic absorption spectroscopy, UV-VIS spectrophotometry, conductometry, potentiometry, pH-metry.

Requirements

The course is scheduled for semester 4. The laboratory practice consists of two separate parts: classical quantitative analysis and instrumental analysis. The classical quantitative analysis part involved acid-base, redox, argentometric and complexometric titrations as well as two gravimetric procedures. The instrumental analysis part will introduce the student to the practice of atomic and molecular spectroscopy, and different electrochemical methods.
Attendance is compulsory at all of the sessions of the laboratory practice. All practice sessions

involved short oral or written tests in order to make sure that student come to the lab fully prepared. Grading is based on three separate factors:
- the average grade of short test written at the beginning of the classical quantitative analysis lab sessions (an average grade of them at least 2.0 is necessary to avoid a "fail" grade)
- the average grade of unknown samples at the classical quantitative analysis lab sessions (an average of them at least 2.0 is necessary to avoid a "fail" final grade)
- the average grade of instrumental analysis lab sessions (an average of them at least 2.0 is necessary to avoid a "fail" final grade).

Subject: **QUANTITATIVE ANALYTICAL CHEMISTRY THEORY II.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **15**

Requirements

Exam: oral
In the oral exam two topics are randomly selected, one from the first (1-13) and the other from the second (14-27) part of the list. During preparation one topic (of your choice) needs to be written in detail while the other will be the subject of an oral exam. The final mark will be determined by the results of the two topics.

Subject closing topic list for pharmacy students
1. Inorganic chemical considerations for the classification of Group I cations. Separation scheme for Group I A and B cations, chemical equations of reactions for the separation and identification of individual cations in this group.

2. Inorganic chemical considerations for the classification of Group II cations. Separation scheme for Group II cations, chemical equations of reactions for the separation and identification of individual cations in this group.

3. Inorganic chemical considerations for the classification of Group III cations. Separation scheme for Group III cations, chemical equations of reactions for the separation and identification of individual cations in this group.

4. Inorganic chemical considerations for the classification of Group IV cations. Separation scheme for Group IV cations, chemical equations of reactions for the separation and identification of individual cations in this group. Chemical equations of reactions for the identification of individual cations in Group V.
5. Classification of anions. Characterization of anions by their reactivity in acid-base, precipitation, complex formation and redox reactions. Chemical equations of anion identification reactions.

6. Chemical reactions in qualitative analysis. Selective, specific and group reactions. Identification tests, purity tests, content analysis. Ways of reporting the sensitivity of test reactions. Masking.

7. Rules of sampling for general and pharmaceutical analysis. Sample preparation for inorganic and organic analysis.

8. Statistical evaluation of the experimental data. Experimental errors. S/N. Statistical tests. Evaluation of the experimental results (types and possible errors of the calibration). Analytical performance parameters.

9. Quantitative description of acid-base equilibria. The Brönsted equation and its use.

10. Complex formation equilibria, apparent stability constants.

11. Precipitation equilibria. Factors influencing the solubility of precipitates.

12. Redox equilibria and redox titration curves.

13. Titration curves and their significant points: equivalent volume, end point, titration errors. Chemical end point detection in titrimetric analysis. Chemical requirements for reagents and standard solutions in titrimetric analysis.

14. Practice of acid-base titrations, possibilities of application.

15.Theoretical background and practice of complexometric titrations. The chelate effect.

16. Permanganometry.

17. Bromatometry and iodometry.

18. Analytical applications of precipitation reactions. Argentometric titration curves. Practice of argentometry.

19. Gravimetry (theoretical background, practical steps, examples).

20. Background of separation methods based on extraction. pH dependence of solute partitioning processes. Determination of metal ions by extraction. Distillation.

21. Theoretical basis of the formation of molecular and atomic spectra. Main application fields of the spectroscopic methods.

22. Construction of the UV-Vis spectrometers (constructions, main parts, principles).

23. The practice of UV-Vis spectroscopy (analytical procedures, application areas, basic law).

24. Theoretical basis of atomic spectroscopy. Main methods and applications of atomic spectroscopy.
25. Potentiometry and its application in analytical chemistry.

26. Conductometry and its application in analytical chemistry.

27. Theoretical basis of chromatography (types, principles, instrumentation (injection, separation, detection), band spreading, separation efficiency, evaluation of chromatograms).

28. Gelelectrophoresis and capillary electrophoresis.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY THEORY I.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Pharmaceutical Technology and the task of Pharmaceutical technology. Definition of drug and dosing. Prescription.

2nd week:
Lecture: The connection between bio-pharmacy and pharmaceutical technology. Basic principles of pharmacokinetics. The connection between pharmaceutical preparation and drug effect.

3rd week:
Lecture: Technological processes : Heating. Distillation. Other methods for separation (sedimentation, centrifugation, expression, drying, filtration).

4th week:
Lecture: Filtration. Theoretical bases of filtration. Types of instruments for filtration.

5th week:
Lecture: Drying. Theoretical bases of drying. Methods of drying. Heating transfer at room temperature. Fluidization. Lyophilization.

6th week:
Lecture: Sterilization. Theoretical bases of sterilization. Methods of sterilization. Methods of physical sterilization. (heat sterilization, sterilization with radiation, sterilization with ultrasound.)

7th week:
Lecture: Aseptic formulation of drug. "Clear surface" . Microbiological purity of dosage forms. Principles for aseptic formulation. Disinfections. Preservation.

8th week:
Lecture: Stability of drugs. Principles of reaction kinetics and the use of reaction kinetics in pharmaceutical technology. Rapid stability investigations.

9th week:
Lecture: Storage of drugs and drug preparations. Factors that influence storage. Packing materials.

10th week:
Lecture: Mixing. Quality of mixing. Duration of mixing. Instruments for mixing. Homogenity.

11th week:
Lecture: Solutions. Thermodynamic terms of solution, dissolution, diffusion, time of dissolution. Possibilities of increasing dissolution. Colligative properties.

12th week:
Lecture: Reology I. Physical and chemical theoretical bases of drug formulation. Monophasic-systems. Mechanical properties of liquids, viscosity, bases of reology. Determination of viscosity.

13th week:
Lecture: Reology II. Di-and polyphasic systems. Interfacial occurrence: interface, interfacial tension. Wetting angle. Dispers polyphasic systems, viscosity of dispers polyphasic systems, sedimentation and flocculation, electrostatic occurrence, coagulation.

14th week:
Lecture: Total Quality Management (TQM)

15th week:
Lecture: The guidelines of Good Manufacturing Practice (GMP)

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control tests and the final exam.

Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn't attend 30% of lectures.

Subject: **PHARMACEUTICAL TECHNOLOGY PRACTICE I.(PRESCRIPTION WRITING I.)**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction, general information. Labour safety, laboratory regulations. Requirements. Weighing. Weighing of chamomile, and talcum. To learn: Latin declension, numbers.

2nd week:
Practical: Technical books of pharmacy (European Pharmacopoeia, Formulae Normales, Hungarian Pharmacopoeia) The prescription, nomenclature. Simple calculations (w/w%). Solutions, knowledge of auxiliary materials. Weighing of Paraffinum liquidum, and distilled water. 1. Solutio acida pro parvulo FoNo VII 100,0g.

3rd week:
Practical: Dose calculations. Reading prescriptions. Preparation simple and composite solutions. 2. Solutio pepsini FoNo VI 50,0g 3. Solutio contra rhagades mamillae FoNo VII 34,0g.

4th week:
Practical: Enemas and solutions internal and external use. 4. Solutio papaverini 50,0g (magistral priscription) 5. Klysma chlorali pro infante FoNo VI 80,0g 6. Solutio theophyllini FoNo VII 100,0g 7. Solutio acriflavini FoNo VI 20,0g.

5th week:
Practical: Nasal and ear drops. Mixture. 8. Mixtura pectoralis FoNo VII 100,0g 9. Otogutta sulfadimidini FoNo VI 10,0g 10. Nasogutta zinci c. ephedrino FoNo VII 10,0g.

6th week:
Practical: Test I.

7th week:
Practical: Gargle and suspensions. 11. Gargarisma chloroformii FoNo VI 125,0g 12. Solutio Castellani sine fuchsino FoNo VII. 13. Suspensio terpini FoNo VII. 100,0g.

8th week:
Practical: Preparation of drops and their dose calculation. 14. Gutta aethylmorphini FoNo VI 10,0g 15. Gutta codeini FoNo VI 10,0g 16. Gutta methylhomatropini composita FoNo VI 10,0g 17. Suspensio anaesthetica FoNo VI 100,0g.

9th week:
Practical: Preparation of decoctions and infusions. 18. Decoctum saponariae FoNo VI 100,0g 19. Infusum ipecacuanhae pro parvulo FoNo VI 100,0g 20. Solutio noraminophenazoni pro parvulo FoNo VII 100,0g.

10th week:
Practical: Preparation of emulsions. 21. Emulsio olei jecoris FoNo VII 100,0g 22. Solutio antisudorica FoNo VII 50,0g 23. Glycerinum boraxatum FoNo VII 20,0g.

11th week:
Practical: Individual drug preparation practice.

12th week:
Practical: Preparation of special emulsions (linimentum). 24. Suspensio siccans FoNo VI 100,0g 25. Linimentum ammoniatum FoNo VI 100,0g 26. Linimentum scabicidum FoNo VI 100,0g.

13th week:
Practical: Test II.

14th week:
Practical: Solutions for veterinary use. 27. Spiritus iodosalicylatus AUV 30,0g 28. Emulsio paraffini cum phenolphtaleino FoNo VII. 29. Suspensio zinci aquosa FoNo VII 100,0g 30. Diluendum menthae.

15th week:
Practical: Supplemental practice. Consultation. Correction.

Requirements

Attendance of practicals is obligatory. Altogether two absences in the semester is permitted. After absence the practical should be made up. Students write short tests in most practices and 2 summery tests. This short test will contain measurement conversions and latin words and phrases. The summery tests will contain the knowledge of Pharmaceutical Technology practicals. The students have only one more chance to improve the summery test if the grade is fail. At the end of the semester students get 5-stage practical grade. This final grade will be the average of 2 summery tests and the grade of short tests.

Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student is absent from the practicals more than allowed in a semester.

Department of Physiology

Subject: **HUMAN PHYSIOLOGY II.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **30**
Seminar: **10**
Practical: **20**

1st week:
Lecture: Introduction, preparation for laboratory practice
Central control of the GI tract
Motor functions of the gastrointestinal tract

2nd week:
Lecture: Secretion of saliva and gastric juice
Exocrine functions of the pancreas and liver
Absorption of nutrients
Control of food intake

3rd week:
Lecture: Vitamins
Test I.

4th week:
Lecture: Energy balance, regulation of body temperature
Introduction, quantitative description of renal function
Mechanism and regulation of glomerular filtration

5th week:
Lecture: Tubular transport processes
Urinary concentration and dilution, clinical correlates
Osmoregulation, water balance, diuretics

6th week:
Lecture: Defense of body fluid volume, sodium balance
Acid-base balance and acid-base disturbances
Calcium homeostasis, physiology of bone

7th week:
Lecture: Potassium balance, mycturition
Test II.

8th week:
Lecture: General principles of endocrinology
Hypophysis, growth hormone

9th week:
Lecture: Male, Female gonadal functions
Pregnancy, lactation

10th week:
Lecture: The thyroid gland I.
The thyroid gland II.

11th week:
Lecture: The hormones of adrenal cortex I.
The hormones of adrenal cortex II.
The hormones of adrenal medulla, catecholamines

12th week:
Lecture: Endocrine regulation of intermedier metabolism I.
Endocrine regulation of intermedier metabolism II.
Endocrine regulation of intermedier metabolism III.

13th week:
Lecture: Test III.

Requirements

1. Signature of Lecture Book

Attendance of lectures, laboratory practices and seminars is compulsory. The signature of the Lecture Book may be refused for the semester in case of more than four absences from the seminars and/or more than two absences from the practices. All missed practices must be made up, whereas the completion of a missed seminar with a different group is not possible. Completion of all topic sheets in the Exercise Book, each verified by the signature of the teacher, is also a precondition of the signature of the Lecture Book. Student must attend seminars with the group appointed by the Educational Office. For continuous updates on all education-related issues please consult with the departmental web-site (http://phys.dote.hu).

The program of the Human Physiology II lectures is listed at the web site of the Department of Physiology (http://phys.dote.hu)

2. Evaluation during the semester (mid-semester tests)

The knowledge of students will be tested 3 times during the semester in the form of a written test (multiple choice questions). Participation on mid-semester written tests is compulsory.
Laboratory practical knowledge of the students will be tested at the end of the second semester as part of the Closing Lab, evaluation with two level marks (accepted or not accepted). As a precondition of attending the Closing Lab, the fully completed Exercise Book (with all the verified topics) must be presented prior to the Closing Lab. Students are expected to perform the given experiment on their own and must be familiar with theoretical background also. In case of a negative result, the Closing Lab can be repeated, but only once. If the final evaluation of the Closing lab is "Accepted", then the student will be exempt for laboratory practical questions in the

written part of the final exam.

3. Examination

The second semester is closed by the final exam covering the topics of all lectures, seminars and laboratory practices of the full academic year. A and B chances are written tests (multiple choice questions), while C chance is an oral exam. The score for the “A exam” is calculated as follows:
score for the “A exam”= (x+y)/2 where
x= average % of the five mid-semester written tests (two in the 1term and three in the 2term)
y= the result of the written test completed on the exam

Then, the grade is calculated according to the following table:

Score	Grade
0 – 59.9 %:	fail
60 – 69.9 %	pass
70 – 79.9 %	satisfactory
80 – 89.9 %	good
90 – 100.9 %	excellent

- If the score of the written test is less than 60% (y<60%), then the result of the exam is fail regardless the average score of mid semester tests (x).

- The grade for the B exam is calculated only from the score of the written test completed on the exam (score for the “B exam”= y).

- For those students who took the written exam at the end of the first semester, the results of both the first semester’s tests will be replaced by the score of the A or B exams. For those students who took oral exam at the end of the first semester, the scores of each 1st term self-control will be replaced with these percentage scores: 2: 65%; 3: 75%; 4: 85%; 5: 95%.

- If the final evaluation of the Closing lab is "Accepted", then the student is exempt for laboratory practical questions in the written part of the final exam.

Division of Pharmacognosy

Subject: **PHARMACOGNOSY PRACTICE I.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction. General discussion.

2nd week:
Practical: Carbohydrate-containing plant drugs I.

3rd week:
Practical: Carbohydrate-containing plant drugs II.

4th week:
Practical: Fixed oils.

5th week:
Practical: Plant drugs containing organic acids and peptides.

6th week:
Practical: Essential oils I.: Monoterpene-based essential oils.

7th week:
Practical: Essential oils II.: Sesquiterpene and phenylpropanoid-based essential oils.

8th week:
Practical: Drugs containing secoiridoids and sesquiterpene lactones.

9th week:
Practical: Iridoids.

10th week:
Practical: Triterpenes, triterpene saponins.
11th week:
Practical: Cardenolid glycosides.

12th week:
Practical: Basic techniques in medicinal plant biotechnology.

13th week:
Practical: Elicitation in medicinal plant tissue cultures.

14th week:
Practical: Oral and written test.

15th week:
Practical: ORAL AND WRITTEN TEST

Requirements

Detailed information is given in the first practical course.

Subject: **PHARMACOGNOSY THEORY I.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: The origins of pharmacognosy. The nomenclature of plant drugs; Sources of drugs, Production of drugs; Basic metabolic pathways, Origin of primary and secondary metabolites. The biosynthetic pathways.

2nd week:
Lecture: Carbohydrates, fats, proteins.

3rd week:
Lecture: Terpenoids, alkaloids, phenolic compounds, Purifed honey, Fig, Manna, Tamarind pulp, Starch, Tragacanth gum, Acacia gum, Sterculia gum, Agar, Irish moss, Linseed, Psyllium, Quince seeds, Marshmallow root, Cotton Fatty acids, Fats, Arachis oil, Olive oil, Sesame oil, Castor oil, Linseed oil, Coconut oil, Cottonseed oil, Maize oil, Theobroma oil, Hydnocarpus oil, Beeswax, Spermaceti, Prostaglandins.

4th week:
Lecture: Proteins, Enzymes.

5th week:
Lecture: Terpenoid compounds, monoterpenes, volatile oils.

6th week:
Lecture: Peppermint, Spearmint, Lavender, Rosemary, Oil of rose.

7th week:
Lecture: Terpenoid compounds, monoterpenes, volatile oils.

8th week:
Lecture: Peppermint, Spearmint, Lavender, Rosemary, Oil of rose.

9th week:
Lecture: Caraway, Dill, Coriander, Thyme, Eucalyptus leaves.

10th week:
Lecture: Cardamomi fruit, Bitter orange peel, Lemon peel, Juniper berris Aniseed, Star anise fruit, Fennel, Cinnamom, Camphor.

11th week:
Lecture: Clove, Nutmeg, Calmus, Ginger, Turmeric.

12th week:
Lecture: Iridoids, Valerian root, Gentian

13th week:
Lecture: Sesquiterpenes, Chamomile flowers, Matricaria flowers, Absinth Fish berries, Santonica flowers, Diterpenoids, Colophony resin, Turpentine Triterpenes, Saponins, Liquorice root, Quillaia bark.

14th week:
Lecture: Senega root, Ginseng; Plant steroids, Steroidal saponins.

15th week:
Lecture: Dioscorea tubers, Sisal, Sarsaparilla root, Solanum sp., Soya bean, Cardiac-glycosides, Digitalis leaf, Digitalis lanata leaf, Oleander, Strophanthus seeds, Convallaria, Adonis, Erysimum, Indian squill, Black hellebore rhizome.

Requirements

Detailed information is given in the first lecture.

Faculty of Pharmacy

Subject: **PUBLIC PHARMACY PRACTICE AFTER 2ND YEAR (PERSONNEL AND OBJECTIVE REQUIREMENTS OF PHARMACY AND PREPARATION OF PHARMACEUTICAL DOSAGE FORMS)**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **120**

Requirements

Syllabus of summer practice for second year pharmacy students

Duration of practice:
4 weeks, 8 hours per day, from which 2 hours may be spent preparing. Second year students are required to gain proficiency in the following areas during their practice at a public pharmacy, and subsequently acquire knowledge about the conditions pertaining to personnel, equipment, supplies, operation, and workflow of a public pharmacy.

Requirements for the student:
Accept and sign the non-disclosure agreement. Any absence from practice must be authentically justified based on the rules of the place of training. All absences must be made up. He/she is

expected to follow the directions of the pharmacist in charge of the training. Skills expected from the student after the completion of practice:
• practical application of theoretical knowledge obtained during his / her studies
• he / she is expected to know the premises and the assets of the public pharmacy and be able to obtain information from manuals and scientific journals used during his / her work
• he / she is expected to learn about the working activities of a public pharmacy
• he / she is required to have an appropriate work relationship with the co-workers in the pharmacy
Student tasks during the practice: Under the supervision of the pharmacist in charge of the training he / she will participate in the following activities:

1. Conditions pertaining to the personnel, equipment and supplies of the pharmacy:
• he / she is required to know the activities expected form the co-workers and the rules and regulations pertaining to them
• he / she is expected to know the rules of procedures
• he / she is expected to know the work protocol of the pharmacy
• he / she is required to be aware of rules and regulations pertaining to premises, equipment, supplies and assets
• he / she is expected to read pharmaceutical manuals and journals
• he / she is required to handle computer programs used in the pharmacy
• he / she is expected to become acquainted with authorities supervising work in pharmacies and representative bodies

2. Preparing medicine: Acquiring knowledge about simple pharmaceutical technologies (measurement, mixing powders, dilution, calculating solution concentration and doses, and other simple calculations performed in pharmaceutical practice) Learning magistral medicine preparation and its tools. Preparation of liquid medication under supervision, appropriate packaging, knowledge of the usage.

Evaluation:
Keeping an electronic notebook: description of 1 syllabus-related practical issue in half / one page every two weeks The pharmacist in charge of the training checks the work and description every second week and evaluates it using a five-point system. He /She sends the electronic notebook to the Dean's Office according to the rules of the place of training. At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in a written form and grades the student based on a three-point system. He / she will send it to the Dean's Office in a printed and signed form according to the rules of the training place. Student evaluation: After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training place.

CHAPTER 18
ACADEMIC PROGRAM FOR THE 3RD YEAR

Department of Anatomy, Histology and Embryology

Subject: **PHARMACEUTICAL NEUROBIOLOGY**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **39**
Seminar: **16**
Practical: **10**

1st week:
Lecture: 1 Introduction. Development of the nervous system. Parts of the nervous system.2 The histology of the nervous system.3 Dura mater, pia mater. Circulation in the brain. Blood-brain barrier.
Practical: Histology: The neural tissue. Histology of the spinal cord.1. Peripheral nerve (HE)2. Spinal ganglion (HE)3. Spinal cord (HE)4. Spinal cord (Bielschowsky impregnation)

2nd week:
Lecture: 1 The structure of the spinal cord.2 The structure of the brainstem and cerebellum.3 The structure of the diencephalon and telencephalon
Practical: Histology of the cerebral and cerebellar cortex.1 Cerebellum (HE) 2 Cerebellum (Golgi impregnation)3 Cerebrum (Golgi impregnation)

3rd week:
Lecture: 1 Biochemistry of the neurones: metabolic pathways in the brain.2 Morphological basis of the neurotransmission. The chemical synapses.3 Axonal transport. Degeneration and regeneration in the nervous system.
Practical: Anatomy: Gross anatomy of the spinal cord and the brain

4th week:
Lecture: 1 Neurotransmitters, biochemistry of the receptors. 2 Presynaptic mechanisms of neurotransmission. 3 Postsynaptic mechanisms of neurotransmission.
Seminar: Biochemistry

5th week:
Lecture: 1 Membrane properties of the neurones and glial cells. 2 Features and significance of the central excitatory and inhibitory synapses. 3 Somatomotor function of the spinal cord.
Practical: Physiology

6th week:
Lecture: 1 The somatomotor system. 2 Vestibular apparatus. 3 Roles of spinal chord in the coordination of movements.
Practical: Physiology

7th week:
Lecture: Roles of brain stem and cerebellum in the coordination of movements.
Practical: Physiology
Self Control Test (SELF CONTROL - THE DATE DEFINED LATER)

8th week:
Lecture: 1 General principles of the somatosensory system. The skin. 2 The somatosensory system. 3 Somatovisceral sensory functions.
Practical: Physiology

9th week:
Lecture: 1 Neural mechanisms of the pain perception. 2 Theoretical background of the pain therapies. 3 Anatomy of the eye.
Practical: Histology: Functional microscopic anatomy of the skin1 Fingertip skin (HE)2 Scalp (HE)

10th week:
Lecture: 1 Biochemistry of vision. 2 Physiology of vision. 3 Physiology of taste and smell sensation.
Practical: Physiology

11th week:
Lecture: 1 Anatomy of auditory and vestibular system. 2 Physiology of hearing. 3 The structure of the autonomic nervous system.
Practical: Histology: Microscopic anatomy of the eyeball and internal ear. 1 Eye (HE) 2. Inner ear (HE)

12th week:
Lecture: 1 Functional properties of the autonomic nervous system. 2 Central vegetative regulation (hypothalamus). 3 The functional properties of the cerebral cortex (EEG).
Practical: Physiology

13th week:
Lecture: 1 Sleep, wakefulness. 2 Learning, memory. 3 The monoaminergic and limbic system.
Practical: Physiology

14th week:
Lecture: 1 Motivation, behaviour, emotions. 2 Information storage in the CNS, memory disorders..
Seminar: Biochemistry
Self Control Test (SELF CONTROL - THE DATE DEFINED LATER)

Requirements

The neurobiology course is an integrated one, delivered as a joint effort of three departments (Departments of Anatomy, Histology and Embryology; Biochemistry and Physiology). In this academic year the Physiology Department is the course organizer. The educational activities of the Neurobiology course include lectures, seminars and practices. Most of the regulations concerning these activities are specific to the individual departments and will be introduced by the respective education officers.
In the detailed program of the course (which, in fact, corresponds to the list of requirements) as well as here, both the compulsory and suggested textbooks are listed. Note, however, that the requirements of the course include material delivered in the lecture hall only, not necessarily available in the recommended textbooks, while in other cases some information in the suggested textbook is not regarded as part of the exam material.
Attendance of the seminars and practices is compulsory, although one may have two seminar and practice absences. If one collects three or more seminar and practice absences (regardless of the reason of the absences) the course organizer may refuse the verification of the lecture book. Making up the missed seminars and practices may be possible, but the individual departments determine the actual procedure.
During the term two self-control tests(SCTs) are organized. Attendance of the SCTs is compulsory. If one meets the passing conditions (see below), the end-semester examination may be substituted with the result achieved on the basis of these tests (i.e. the student in question will be exempted of the final exam). The maximum achievable score is 100 points in the following distribution:

Anatomy: 40 points
Biochemistry: 17.5 points
Physiology: 42.5 points

The points collected in the frame of the two tests will be summarized on a departmental basis. If someone collects at least 60 % of the total number of points provided by the individual departments, she/he will be exempted of the end-semester examination (ESE). The 60 % limit is the following on departmental basis:

Anatomy: 24 points
Biochemistry: 10.5 points
Physiology: 25.5 points

If someone reaches the 60% limit of all departmental scores, the ESE result can be calculated in the following way:

Total number of points score

0 - 59 points: fail
60 - 69 points: pass
70 - 79 points: satisfactory
80 - 89 points: good
90 - 100 points: excellent

If the departmental score achieved by the student is more than 60%, and he/she wishes to improve this score, it can be done on any of the exam days.

Department of Foreign Languages

Subject: **MEDICAL HUNGARIAN I.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Bevezetés, ismétlés

2nd week:
Practical: Testrészek

3rd week:
Practical: Belső szervek

4th week:
Practical: Betegségek

5th week:
Practical: Gyakoribb gyógyszerek

6th week:
Practical: Gyógyszerek fajtái

7th week:
Practical: Gyakorlás

8th week:
Practical: Mid-term test

9th week:
Practical: Gyógyszerek csomagolási formái

10th week:
Practical: Gyakori mellékhatások

11th week:
Practical: Kérdések gyakorlása

12th week:
Practical: Dialógusok

13th week:
Practical: Eszközök a gyógyszertárban

14th week:
Practical: Ismétlés

15th week:
Practical: End-term test

Requirements

Attendance
The attendance is compulsory for the language classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the signature is refused and the student has to repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.
Students are not allowed to take Medical Hungarian course before entering 3rd year.

Testing, evaluation
In Medical Hungarian course, students have to sit for a mid-term and an end-term written and oral language tests and at the end of the 2nd semester a final exam. Further minimum requirement is the knowledge of 200 words in each semester announced on the first week. Every week there is a (written or oral) word quiz from 20 words in the first 5-10 minutes of the class. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam from all the 200 words along with the oral minimum exam. The results of word quizzes can modify the evaluation at the end of the semester. The oral minimum exam consists of a role-play randomly chosen from a list of situations announced in the beginning of the course. Failing the oral minimum results in failing the whole course. The result of the oral minimum exam is added to the average of the mid-term and end-term tests.The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not reach this score he/she has to repeat the test. Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60 the student once can take an oral remedial exam covering the material of the whole semester.

Consultation classes
In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional for the students.

Website: Vocabulary minimum lists and further details are available on the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Department of Laboratory Medicine

Subject: **CLINICAL BIOCHEMISTRY I.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **30**
Practical: **14**

1st week:
Lecture: 1. Introduction: pathobiochemistry, clinical chemistry, laboratory diagnostics 2. Different levels of laboratory diagnostics (reference values, requesting test, interpretation of results)

2nd week:
Lecture:
3. Laboratory aspects of investigating human disorders
4. Pathochemistry and laboratory signs of cell damage

3rd week:
Lecture:
5. Pathobiochemistry of inflammation
6. Pathobiochemistry of plasma proteins

4th week:
Lecture: 7. Clinical biochemistry of tumor metastasis 8. Pathobiochemical alterations in association with tumor growth and metastasis formation and their laboratory detection I.

5th week:
Lecture: 9. Pathobiochemical alterations in association with tumor growth and metastasis formation and their laboratory detection II. 10. Tumormarkers in the diagnosis of malignant diseases

6th week:
Lecture: 11.Inherited metabolic diseases and their laboratory diagnostics I. 12. Inherited metabolic diseases and their laboratory diagnostics II.

7th week:
Lecture:
13. Inherited metabolic diseases and their laboratory diagnostics III. 14. Disorders of iron metabolism. Laboratory diagnostics of microcytic anemias.

8th week:
Lecture:
15. Laboratory diagnostics of hemoglobinopathies
16. Laboratory diagnostics of macrocytic and hemolytic anemias

9th week:
Lecture:
17. Laboratory diagnostics of quantitative platelet disorders.
18. Laboratory diagnostics of acut and chronic leukemias and lymphomas I.

Practical: Notes on Laboratory Safety. Molecular genetic methods in clinical biochemistry.
Self Control Test

10th week:
Lecture:
19. Laboratory diagnostics of acut and chronic leukemias and lymphomas II. 20. Laboratory diagnostics of avut and chronic leukemias and lymphomas III.
Practical: Hematology I. Blood sampling, anticoagulation. Preparation of blood smears, staining.

11th week:
Lecture:
21.History of blood transfusion, blood group

serology
22. Biochemistry, inheritance and antigens of ABO blood group system and its clinical significance

Practical: Hematology II. Morphology of red blood cells in different disorders and reticulocyte counting.

12th week:
Lecture:
23. Biochemistry, inheritance and antigens of Rh blood group system and its clinical significance
24. Other blood group system (Kell, Kidd, Duffy, MN, Ss, Ii)

Practical: Hematology III. Determination of hemoglobin and hematocrit. Hematology analyzers.

13th week:
Lecture:
25. Laboratory diagnostics of central nervous system diseases. Laboratory investigation of the cerebrospinal fluid.
26. Clinical biochemistry at the extremes of ages

Practical: Hematology IV. Investigation of peripheral blood smears in hematological malignancies. Myeloma multiplex.

14th week:
Lecture:
27. Clinical biochemistry and laboratory diagnostics of porphyrias
28. Therapeutic drug monitoring I.

Practical: Transfusiology. ABO and Rh blood group determination.

15th week:
Lecture:
29. Therapeutic drug monitoring II.
30. Vitamins

Practical: Detection of irregular antibodies. Antibody screening and compatibility testing.
Self Control Test

Requirements

Participation on practicals:
Attendance of practicals is obligatory. Altogether one absence in the first semester and two absences in the second semester are permitted. In case of further absences, the practicals should be made up for by attending the practicals with another group in the same week, or a medical certificate needs to be presented. Please note that strictly only a maximum of 3 students are allowed to join another group to make up for an absence.
Requirements for signing the Lecture book: The Department may refuse to sign the Lecture book if the student is absent from practicals more than allowed in a semester.
Assessment: At the end of the first and second semester there is a written examination (test) assessed by a five grade evaluation.

Requirements for examinations:
The examination is based on the lecture and practical material (Practicals in Laboratory Medicine, eds.: János Kappelmayer and László Muszbek, 2010) as well as the relevant chapters from the textbook of Marshall and S.K. Bangert: Clinical Chemistry (7th edition, 2012).

Department of Pharmaceutical Chemistry

Subject: **PHARMACEUTICAL CHEMISTRY PRACTICE I.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Short introductory practice.

2nd week:
Practical: Analytical exercises of selected inorganic compounds according to the Pharmacopeia.

3rd week:
Practical: Analytical exercises of selected inorganic compounds according to the Pharmacopeia.

4th week:
Practical: Analysis of alcohols, citric acid, urea, benzoic acid, resorcinol, thymol, methenamine

5th week:
Practical: Analysis of alcohols, citric acid, urea, benzoic acid, resorcinol, thymol, methenamine

6th week:
Practical: Vitamines and pain killers

7th week:
Practical: Vitamines and pain killers

Requirements

The laboratory practice is organized in groups, 7x4 hours. The presence of students at the practices is obligatory. If the student is absent from more than one practices, the semester will not be accepted (there is no possibility to arrange additional extra lab practices).

The semester of the student's lab practice will not be accepted in either of the following cases:
1. three unacceptable written tests/demos with the evaluation "Failed" (Mark "1")
2. the student was not permitted to start the Lab Practice in two occasions*
3. the student presented two unacceptable Lab Practice written tests/demos with the evaluation "Failed" (Mark "1"), and was not permitted to start the Lab Practice in one occasion*
4. five demos or notebooks with the evaluation "Failed" (Marks "1" or "0") altogether in any combination
5. the average of the marks is below 2.0
6. When the student can not present 4 successful Lab Practices in the semester

*The student will not be permitted to start a Lab Practice in either of the following cases:

1. the student does not show up in the laboratory in 20 minutes from the scheduled starting date of the Practice
2. the student can not present her/his lab practice notebook prepared according to the said requirements
3. the student is unable to reach at least 5.0 points (55.5%) of the maximum score (9.0 points) related to the questions asked in connection with the topics of the Laboratory Practice!
4. When writing the test, cabs and other illegal sources are not allowed to use. If the student is

found out in a cheating, the student must leave the Lab, and the Practice will be considered unsuccessful (Mark "0").

Subject: **PHARMACEUTICAL CHEMISTRY THEORY I.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **45**

1st week:
Lecture: Topics and history of pharmaceutical chemistry. Pharmacopeia, as the standard of quality control. Physical and chemical investigations. Methods for the identification and control of medicinal substances. Nomenclature of the medicinal substances.
Practical: Short introductory practice.

2nd week:
Lecture: Pharmacologically important inorganic compounds.
Practical: Analytical exercises of selected inorganic compounds according to Pharmacopeia.

3rd week:
Lecture: General anesthetics: inhalation anesthetics, barbital and non-barbital-type narcotics. Anesthetics with pregnane skeletone. Sedatives and hypnotics: alcohols, aldehydes, urethanes, barbiturates and with 4-quinazolone, bezodiazepine and piperidine skeletone.
Practical: Alcohols, solvents. Barbituric acid derivatives.

4th week:
Lecture: Antiepileptic agents (anticonvulsants): compounds with barbiturate, hydantoin, oxazolidin-dione, succinimide and acylurea structure.
Practical: Aminophenazon derivatives, urethan, phenytoin.

5th week:
Lecture: Narcotic Analgetics: codeine, morphine, thebaine derivatives Morphinane, bezomorphane, phenylpiperidine and metadone derivatives. Non-diphenylmethane -type amines. Another major analgetics. Competitive antagonists of morphine and morphine derivatives.
Practical: Selected aromatic compounds: resorcinol, thymol, acetylsalicylic acid etc.

6th week:
Lecture: Analgetic antipyretics: derivatives of salicylic acid, aniline, and anthranylic acid. Pyrazolone- and arylacetic acid-type analgetics.
Practical: Phenothiazin derivatives; methenamine.

7th week:
Lecture: Analgetic antipyretics: steroid anti-inflammatory agents. Antihistamines.
Practical: Carbohydrates, ascorbic acid, citric acid.

8th week:
Lecture: Psychopharmacones: anxiolytics (minor tranquilizers): carbamates, benzodiazepines, and diphenylmethane-type compounds. Another anxiolytics.

9th week:
Lecture: Antipsychotics, neuroleptics (major tranquilizers): Reserpine. Derivatives of phenothiazine and butyrophenone. Diphenylbutyl piperidines.

10th week:
Lecture: Antiparkinson agents: piperidylphenyl propanols, diphenyl-methanes, phenothiazines, thioxanthenes.

11th week:
Lecture: Psychostimulants: Analeptics. Phenylethyl amine, piperidine, morpholine and oxazoline derivatives. Anorectic agents. Psychoenergetic agents: monoamin-oxidase

(MAO) inhibitory compounds, tricyclic antidepressants. Psychomimetics: LSD, psylocibine, mescaline, tetrahydrocannabiol.

12th week:
Lecture: Central and peripheral antitussive agents. Expectorants. Bronchodilators. Medicines effective on the nasal and other mucosa, and on the respiratory system.

13th week:
Lecture: Central Muscle relaxants: ethers of glycerol and derivatives of 1, 3-propanediol. Peripheral muscle relaxants: substances with membrane-stabilizing and depolarizing effects.

14th week:
Lecture: Parasymphatomimetics: acetylcholin and the direct parasymphatomimetics. Nitrogen-containing, and organophosphoric ester-type cholinesterase inhibitors (paralysers). Insecticids. Cholinesterase-reactivating antidote.

15th week:
Lecture: Parasymphatolytics: alkaloids with tropane skeletone. Synthetic tropane derivatives. Another parasymphatolytics without tropane skeletone.

Requirements

Lectures:
Attendance to lectures is emphatically recommended. All material covered in lectures is an integral part of the subject and therefore included in the self-control tests and the final exam. Several new concepts and ideas are discussed in the lectures only and are not present in the textbook. Examination is possible only after a succesfully finished laboratory practice.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY PRACTICE II. (INDUSTRIAL PRACTICE I.)**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Aseptic requirements. Preparation of infusions. Tests.

2nd week:
Practical: Infusio natrii chlorati Ph.Hg. VII., Infusio salina Ph.Hg. VII.

3rd week:
Practical: Infusio glucosi Ph.Hg. VII., Infusio manniti 100mg/m Ph.Hg. VII.

4th week:
Practical: Infusio natrii lactici Ph.Hg. VII., Infusio gastrica

5th week:
Practical: Test from infusions.

6th week:
Practical: General principles and technologies of granulation, excipients of granules.

7th week:
Practical: Wet granulation by kneading.

8th week:
Practical: Pharmacopoeial tests and test devices of granules.

9th week:
Practical: General principles and technologies of tablet compression, tablet presses.

10th week:
Practical: Test from tableting

11th week:
Practical: Galenic drug preparation, aims and methods. Pharmaceutical standard procedures. Liquid dosage forms ‘1. Galenic solutions, suspensions.

12th week:
Practical: Liquid dosage forms ‘2. Syrups and Colloidal solutions. Formulation techniques, equipment.

13th week:
Practical: Semisolid dosage forms ‘1. Hydrophilic ointments. Formulation techniques, equipment.

14th week:
Practical: Semisolid dosage forms ‘2. Hydrophobic ointments. Formulation techniques, equipment.

15th week:
Practical: Quality control tests, assessment of practice results.
Self Control Test

Subject: **PHARMACEUTICAL TECHNOLOGY PRACTICE II. (PRESCRIPTION WRITING II.)**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Course: Prescription, Pharmacy Introduction, general information. Labour safety, laboratory regulations. Requirements. Solution, emulsion, suspension. 1.Emulsio olei ricini FoNo VII. 2. Suspensio nystatini FoNo VII. 3. Solutio nephrolytica FoNo VII. Course: Sterile and aseptic formulations. Requirements for aseptic preparations. Requirements for infusions: Not always obligatory requirements. Always obligatory requirements. Preparation of infusions solutions. Quality control of infusion solutions. Electrolyte-containing infusion solutions: Infusio natrii chlorati (Ph.Hg.VII.), Infusio salina (Ph.Hg.VII.).

2nd week:
Practical: Course: Prescription, Pharmacy European Pharmacopoeia. Suppositories, liniments. 4. Linimentum ad pernionem FoNo VII. 5. Calibration of suppository moulds individually (1,2,3g) with Adeps solidus 50, Adeps solidus compositus, Massa macrogoli. Course: Sterile and aseptic formulations, Calculations for the concentration of infusion solutions. Pyrogens. Sugar-containing infusion solutions: Infusio glucosi (Ph.Hg.VII.) Infusio manniti (Ph.Hg.VII.).

3rd week:
Practical: Course: Prescription, Pharmacy 6. Determination of replacement factors 2w/w% aminophenazon in Adeps solidus 50 suppository base 5w/w% acetaminophenum in Adeps solidus compositus suppository base. 7. Suppositorium aminophenazoni 0,10g FoNo VI. Course: Sterile and aseptic formulations. Sterilization. Supplementary infusion solutions. Infusion solutions against acidosis: Infusio natrii hydrogencarbonici 1,3% (Ph.Hg.VII.) Infusion solutions against alkalosis: Infusio gastrica.

4th week:
Practical: Course: Prescription, Pharmacy Preparation of ointments. 8. Unguentum antiseptica FoNo VII. (typical suspension ointment) 9. Unguentum carbamidi FoNo VII. (dissolved ointment) 10. Unguentum boraxatum

cum aqua calcis FoNo VII. (w/o ointment) 11. Suppositorium antispastica pro parvulo FoNo VI. Course: Sterile and aseptic formulations. Preparation of eye drops: Oculogutta neomycini FoNo VII. 10,0g Oculogutta zinci FoNo VII. 10,0g.

5th week:
Practical: Course: Prescription, Pharmacy Preparation of pilulas. 12. Cremor aquosus FoNo VII. (o/w ointment) 13. Unguentum nasale FoNo VII. 14. Pilula coffeini FoNo VI. 15. Suppositorium laxans FoNo VII. Course: Sterile and aseptic formulations. Test.

6th week:
Practical: Course: Prescription, Pharmacy Test 1. Course: Formulation of tablets and granules. Tablets in general. Tableting mechanism. Types of tablet machines. Single punch and rotary tablet machines. Assembling and operation of a tablet machine. Preparation: Tabletta acidi acetylsalicylici.

7th week:
Practical: Course: Prescription Pharmacy 16. Unguentum salicylatum FoNo VII. in different percentage. 17. Suppositorium analgeticum forte FoNo VII. 18. Unguentum contra dolorem FoNo VII. 19. Solutio metronidazoli FoNo VII. Course: Formulation of tablets and granules. Granulates and granulation. Quality control of granulates. Granulation with binding agents I. Preparation: Granulatum magnesii trisilicici.

8th week:
Practical: Course: Prescription Pharmacy 20. Suppositorium spasmolyticum FoNo VII. 21. Unguentum contra rhagades mamillae FoNo VII. 22. Solutio contra rhagades mamillae FoNo VII. 23. Unguentum contra oxyurim FoNo VII. Course: Formulation of tablets and granules. Granulation with binding agents II. Preparation: Tabletta codeinii chlorati.

9th week:
Practical: Course: Prescription Pharmacy 24. Unguentum refrigerans FoNo VII. 25. Suppositorium ad nodum FoNo VII. 26. Unguentum hemorrhoidale FoNo VII. 27. Unguentum nutritivum FoNo VII. Course: Formulation of tablets and granules. Quality control of tablets. Preparation: Tabletta papaverinii chlorati.

10th week:
Practical: Course: Prescription, Pharmacy Undivided powders. 28. Pulvis antacidus FoNo VII. 29. Pulvis Caroli FoNo VII. 30. Unguentum camphoratum ad pernionem FoNo VII. Course: Formulation of tablets and granules. Test.

11th week:
Practical: Course: Prescription Pharmacy. Individual drug preparation practice. Course: Galenic preparations and their manufacture. Preparation and investigation of solutions.

12th week:
Practical: Course: Prescription Pharmacy 32. Sirupus zinci FoNo VII. 33. Suppositorium antiemeticum FoNo VII. 34. Unguentum contra rheumam FoNo VII. 35. Sal ad rehydrationem in different compositions FoNo VII. Course: Galenic preparations and their manufacture. Preparation and investigation of syrups.

13th week:
Practical: Course: Prescription Pharmacy Test 2. Course: Galenic preparations and their manufacture. Preparation and investigation of suspensions.

14th week:
Practical: Course: Prescription Pharmacy 36. Calibration of vaginal moulds with Massa macrogoli 37. Determination of replacement factors of nystatin. (3w/w% nystatin in Massa macrogoli) Course: Galenic preparations and their manufacture. Preparation and investigation of emulsions.

15th week:
Practical: Course: Prescription, Pharmacy Supplemental practice. Consultation. Correction. Course: Galenic preparations and their manufacture. Test.

Requirements

Attendance of practicals is obligatory. Beside pharmaceutical technology practice students have Tabletting, Infusion and Galenic preparation practice. Altogether two absences in the semester is permitted. After absence the practical should be made up. Students write short tests in most practices and 2 summery tests from pharmaceutical technology practice. Also they write final tests from Tabletting, Galenic preparation and Infusion practices. The students have only one more chance to improve the summery test if the grade is fail. At the end of the semester students get 5-stage practical grade. This final grade will contain the marks from pharmaceutical technology practice, tabletting, infusion and galenic preparations.

Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student is absent from the practicals more than allowed in a semester.

Subject: **PHARMACEUTICAL TECHNOLOGY THEORY II.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Pharmaceutical dosage forms: liquid pharmaceutical forms, solutions, stock solutions, aqueous solutions, oily solutions, syrups, aromatic waters, gargles, alcoholic solutions.

2nd week:
Lecture: Colloid systems. Molecular colloids, association colloids (termotrop and liotrop association colloids). Mucilages, enemas.

3rd week:
Lecture: Ophthalmic pharmaceutical forms, definitions. Anatomy of the eye, biopharmacy problems. Requirements for ophthalmic pharmaceutical forms. (compatibility, without irritation, free from bacteria, stability). Basic principles for pharmaceutical formulation. Special ophthalmic pharmaceutical forms, contact lamella, contact lens. Tanks. Ear drops, nasal drops.

4th week:
Lecture: Emulsions. Macro and micro-emulsions. Emulsifying agent. Stability of emulsions. Stabilization of emulsions. Formulation of emulsions, investigations.

5th week:
Lecture: Suspensions. Definitions, types of suspensions, physical and chemical basics of suspensions. Stability of suspensions. Formulation of suspensions, investigations.

6th week:
Lecture: Injections. Basic principles. Definitions. Methods of administration. Biopharmaceutical problems. Basic requirements for the formulation of injections. Active agents and ingredients of injectable systems. Solvents. Formulation of injections.

7th week:
Lecture: Tanks for injections, filling and closing. Sterilization. Examination of injections and quality assurance. Stabilization of injections. Special injectable solutions. (injectable suspensions, dry powder, tablets)

8th week:
Lecture: Infusion systems. Basic principles. Formulation of infusions. Investigation of infusions. Special infusion systems. Tanks (use of plastic tanks.). Parenteral nutritive infusions, fat emulsions. All in one mixtures.

9th week:
Lecture: Blood and blood preparations. Blood preservative solutions. Solutions for volume substitution. Formulation of serum and vaccine.

Exemption of HIV.

10th week:
Lecture: Inhalations and aerosols. Definitions. Biopharmaceutical problems. Formulation of inhalations and aerosols in theory and also in practice. Propellants. Dosage forms that protect environment. Containers for aerosols. Filling of aerosols. Investigation of aerosols.

11th week:
Lecture: Ointments. Definitions, nomenclature. Colloidal theory of ointment bases. Classification of ointment bases.

12th week:
Lecture: Formulation of ointment, cream, paste and hydrogel. Requirements for choosing the suitable ointment base. Biopharmacy of ointments. Quality assurance of ointments. Ophthalmic ointments, paste.

13th week:
Lecture: Pharmaceutical dosage forms for rectal use. Definitions. Suppository bases and suppository ingredients. Formulation of suppository by cold compression and moulding. Special formulations for suppositories, investigation of suppositories. Suppository mold.

14th week:
Lecture: Vaginal pharmaceutical forms (vaginal suppositories, vaginal balls,-cylinders,-tablets).Other vaginal pharmaceutical forms. Biopharmaceutical problems. Pills. Formulation of pills. Control of pills. Bolus.

15th week:
Lecture: Consultation.

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control tests and the final exam.
Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn’t attend 30% of lectures.

Division of Pharmacognosy

Subject: **PHARMACOGNOSY PRACTICE II.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction. General discussion.

2nd week:
Practical: Alkaloids I.

3rd week:
Practical: Alkaloids II.

4th week:
Practical: Alkaloids III.

5th week:
Practical: Anthraquinone containing plant drugs.

6th week:
Practical: Flavonolignane and dianthrone containing plant drugs.

7th week:
Practical: Flavonoid containing plant drugs I.

8th week:
Practical: Flavonoid containing plant drugs II.

9th week:
Practical: Tannin containing plant drugs.

10th week:
Practical: Coumarin containing plant drugs.

11th week:
Practical: Plant drugs containings miscellaneous phenolic compounds.

12th week:
Practical: Examination of herbal tea mixtures.

13th week:
Practical: Examination of herbal tea mixtures. Identification of plant drugs. Consultation.

14th week:
Practical: Oral and written test.

15th week:
Practical: Oral and written test.

Requirements

Detailed information is given in the first practical course.

Subject: **PHARMACOGNOSY THEORY II.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Alkaloids, history, distribution, properties.

2nd week:
Lecture: Ornithine-derived alkaloids, Hyoscyamus leaf, Egyptian Hen-bane Stramonium leaf, Belladonna herb and root, Duboisia leaves, Coca leaf and Cocaine.

3rd week:
Lecture: Lysine-derived alkaloids, Lobelia, Tobacco alkaloids.

4th week:
Lecture: Phenylalanine-derived alkaloids, Ephedra, Khat.

5th week:
Lecture: Opium poppy, Opium, Hydrastis, Ipecacuanha, Colchicum seed and Corm.

6th week:
Lecture: Triptophan-derived alkaloids, Ergot, Calabar bean, Nux vomica, Rauwolfia, Catharanthus roseus, Cinchona.

7th week:
Lecture: Imidazole alkaloids, Jaborandi leaf and pilocarpine.

8th week:
Lecture: Purine alkaloids, Coffee seed, Thea, Cocoa seed, Maté leaf, Cola, Guarana.

9th week:
Lecture: Phenols and phenolic glycosides; Phloroglucinol-derivatives, Male fern.

10th week:
Lecture: Anthraquinones and glycosides, Senna leaf, Cascara bark, Frangula bark, Rhubarb,

Aloes.

11th week:
Lecture: Flavonoid compounds, Silybum, Sambucus.

12th week:
Lecture: Tannins, Galls and Tannic acid, Hamamelis, Catechu, Rhatany Coumarins and their glycosides, Visnaga.

13th week:
Lecture: Lignans, Podophyllum and Podophyllum resin.

14th week:
Lecture: Simple phenolic compounds, Vanilla and Vanillin, Baerberry leaves, Cinnamom, Capsicum, Henna, Indian hemp.

Requirements

Detailed information is given in the first lecture.

Department of Foreign Languages

Subject: **MEDICAL HUNGARIAN II.**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Bevezetés, ismétlés

2nd week:
Practical: High frequency verbs used in pharmacy

3rd week:
Practical: Az emésztőrendszer és a hozzá kapcsolódó gyógyszerek

4th week:
Practical: Hashajtók

5th week:
Practical: Légzőrendszerrel kapcsolatos gyógyszerek

6th week:
Practical: Köptetők

7th week:
Practical: Gyakorlás

8th week:
Practical: Mid term test

9th week:
Practical: Bőr és bőrre való készítmények

10th week:
Practical: Szem és szemre való készítmények

11th week:
Practical: Gyógynövények

12th week:
Practical: Párbeszéd a gyógyszertárban I.

13th week:
Practical: Mini presentations

14th week:
Practical: Ismétlés

15th week:
Practical: Oral exam. Evaluation

Requirements

Attendance
Language class attendance is compulsory. The maximum percentage of allowable absences is 10% which is a total of 2 out of the 15 weekly classes. Students arriving late for the classes are not allowed to enter the class. Being late is counted as an absence. If the number of absences is more than two, the signature is refused and the student has to repeat the course. Students are required to bring the textbook or other study material given out for the course with them to each language class. Active participation is evaluated by the teacher in every class. If students' behaviour or conduct does not meet the requirements of active participation, the teacher may evaluate their participation with a "minus" (-). If a student has 5 minuses, the signature may be refused due to the lack of active participation in classes.
Students are not allowed to take Medical Hungarian course before entering 3rd year.

Testing, evaluation
In Medical Hungarian course, students have to sit for a mid-term and an end-term written and oral language tests and at the end of the 2nd semester a final exam. Further minimum requirement is the knowledge of 200 words in each semester announced on the first week. Every week there is an or oral) word quiz from 20 words in the first 5-10 minutes of the class. If a student has 5 or more failed or missed word quizzes he/she has to take a vocabulary exam from all the 200 words along with the oral minimum exam. The results of word quizzes can modify the evaluation at the end of the semester. The oral minimum exam consists of a role-play randomly chosen from a list of situations announced in the beginning of the course. Failing the oral minimum results in failing the whole course. The result of the oral minimum exam is added to the average of the mid-term and end-term tests. Based on the final score the grades are given according to the following table:

Final score	Grade
0 – 59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the final score is below 60 the student once can take an oral remedial exam covering the material of the whole semester.

Consultation classes
In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional for the students.

Coursebook: Krasznai Mónika: Bevezetés a gyógyszerészi szaknyelvbe

Website: Vocabulary minimum lists and further details are available on the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Department of Immunology

Subject: **IMMUNOLOGY**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **26**
Seminar: **3**
Practical: **8**

1st week:
Lecture: Elements of the immune system. The structure of lymphoid tissues, primary and secondary lymphoid organs.

2nd week:
Lecture: Component and cells of the innate response. Characteristics and function of the innate immune response.
Seminar: Characteristics and function of the innate immune response. Components and cells of the innate response.

3rd week:
Lecture: B-lymphocytes. An introduction to antibody structure and function.
Seminar: B-lymphocytes. An introduction to antibody structure and function.

4th week:
Lecture: T-lymphocytes. Antigen presentation. Functions of T cell types.
Practical: T-lymphocytes. Antigen presentation.

5th week:
Lecture: Naive and effector T cells. Immunotolerance. The polimorphism of MHC molecules.
Practical: Naive and effector T cells. Immunotolerance. The polimorphism of MHC molecules.

6th week:
Lecture: Antigen-dependent differentiation of B-lymphocytes.
Practical: Antigen-dependent differentiation of B-lymphocytes.
Self Control Test

7th week:
Lecture: The molecular basis of antigen recognition by B and T-lymphocytes. B and T cell development.
Practical: The molecular basis of antigen recognition by B and T-lymphocytes. B and T cell development.

8th week:
Lecture: The development of immunological memory. Active and passive immunization.
Practical: The development of immunological memory. Active and passive immunization.

9th week:
Lecture: The immune response to intracellular pathogens. The Immune response to extracellular pathogens.
Practical: The immune response to intracelllular and extracellular pathogens.

10th week:
Lecture: Hypersenstivity reactions. Mechanisms of the development of autoimmune diseases.
Practical: Hypersenstivity reactions, autoimmune diseases.
Self Control Test

11th week:
Lecture: Tumor immunology, monoclonal antibodies, monoclonal antibodies in tumor therapy.
Practical: Tumor immunology, monoclonal antibodies.

12th week:
Lecture: Transplantation. Immunosupression in clinical practice.
Practical: Transplantation, immunosupression in clinical practice.

14th week:
Self Control Test

Requirements

Signing of the Lecture Book:
Participation in the Seminars and the Practical Courses is compulsory. The Department shall refuse to sign the students' Lecture book if he/she is absent from more than two seminars during semester.

Self control tests (SCTs), offered grades, end-term exam:
During the semester two self control test (SCT) will be organised (weeks 6 and 14).
The first SCT contains the material of the lectures of weeks 1-4 as well as the material of seminars on weeks 2-4. To ensure a solid basic knowledge of immunology, students must score higher than 60% to qualify for the 2nd SCT, hence for an offered grade.
The 2nd SCT contains the material of lectures 5-13 and seminars 5-12
If a student's score for the first SCT is higher than 60% and the score of the second SCT is higher than 50%, she/he will be offered a grade. Should student accept this offered grade, she/he will be exempted from the end-term exam.
The offered grades are calculated by the following algorithm, based on the cumulative percentage points of the two SCTs (i.e. 200 points maximum).

110 - 139:	pass (2)
140 - 149:	satisfactory (3)
150 - 169:	good (4)
170 – 200:	excellent (5)

Those students who have not qualified for an offered grade must take the end-term exam during the exam period. The end-term exam consists of a written and an oral part.
"A" exam: To qualify for the oral part of an "A" exam, students must score higher than 70% on the written (entry) exam. Students who score less than 70% on the written part will fail (thus, the oral exam will not take place).
"B" exam: "B" exams are identical to "A" exams except when the student failed the oral, but not the written, part of the "A" exam. With a score of higher than 70% on the written part of the "A" exam, the student is exempt from the written exam on the "B" exam.
"C" exam: "C" exams are oral exams only, without a written entry test.
Those students who would like to improve the grade of a successful ("A" or "B" exam) or do not accept the offered grade, are also exempted from the entry test.
The list of exam topics is available on the departmental website (www.immunology.unideb.hu).
Lecture materials and other information concerning education can be found on our website at www.immunology.unideb.hu by clicking the link "For Students".

Department of Laboratory Medicine

Subject: **CLINICAL BIOCHEMISTRY II.**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **60**
Seminar: **8**
Practical: **30**

1st week:
Lecture: 1. Coagulopathies, (general introduction), haemophilias. 2. von Willebrand disease 3. Other coagulopathies, platelet function disorders
Practical: Laboratory informatics

2nd week:
Lecture: 4. Inherited thrombophilias 5. Acquired thrombophilias 6. Prethrombotic state, thromboembolias, consumption coagulopathies
Practical: Laboratory diagnostics of coagulopathias

3rd week:
Lecture: 7. Disorders of sodium and water metabolism I 8. Disorders of sodium and water metabolism II 9. Disorders of sodium and water metabolism III.
Practical: Laboratory diagnostics of Thrombophilia. Laboratory monitoring of anticoagulant therapy

4th week:
Lecture: 10. Disorders of potassium metabolism 11. Pathobiochemistry of the renal function I. 12. Pathobiochemistry of the renal function II.
Practical: Laboratory diagnostics of platelet function disoerders. Laboratory monitoring of antiplatelet therapy

5th week:
Lecture: 13. Disturbances of the acid-base balance 14. Laboratory diagnostics of renal disorders 15. Pathogenesis and pathomechanism of diabetes mellitus
Practical: Laboratory diagnostics of renal disorders

6th week:
Lecture: 16. Laboratory diagnostics of diabetes mellitus 17. Pathobiochemistry and clinical biochemistry of the acute complications of diabetes mellitus 18. Hypoglycaemias
Practical: Examination of urine sediment
Self Control Test

7th week:
Lecture: 19. Disorders of lipid metabolism 20. Laboratory diagnostics of hyperlipidemia 21. Laboratory diagnostics of acute coronary syndrome I.
Practical: Basic laboratory methods in metabolic diseases

8th week:
Lecture: 22. Laboratory diagnostics of acute coronary syndrome II. (D) 23. Risk factors of atherosclerosis 24. Laboratory diagnostics of hyperuricaemia and gout
Practical: Drug monitoring

9th week:
Lecture: 25. Pathobiochemistry of liver disorders I. 26. Pathobiochemistry of liver disorders II. 27. Laboratory diagnostics of liver disorders. Pathobiochemsitry of acute hepatic disorders
Practical: Serum lipid measurements

10th week:
Lecture: 28. Pathobiochemistry and laboratory diagnostics of cholestasis and cirrhosis29. Pathobiochemistry and laboratory diagnostics of the gastrointestinal tract I. 30. Pathobiochemsitry and laboratory diagnostics of the gastorintestinal tract II.
Practical: Chromatography, respiratory test
Self Control Test

11th week:
Lecture: 31. Laboratory diagnostics of acute pancreatitis 32. Clinical biochemsitry of hypothalamus and hypophysis 33. Pathobiochemistry of thyroid disorders
Practical: Laboratory diagnostics of myocardial infarction

12th week:
Lecture: 34. Laboratory diagnostics of thyroid functions 35. Clinical chemistry of parathyroid disorders 36. Disorders of calcium, phosphate and magnesium metabolism
Practical: POCT

13th week:
Lecture: 37. Pathobiochemistry and laboratory diagnostics of adrenal cortex disorders38. Pathobiochemistry and laboratory diagnostics of adrenal medulla disorders 39. Clinical biochemistry of gonadal functions
Practical: Laboratory evaluation of liver and pancreas function

14th week:
Lecture: 40. Laboratory diagnostics of muscle disorders 41. Laboratory diagnostics of bone disorders 42. Demonsration of practical pictures
Practical: Laboratory evaluation of liver and pancreas function - case presentation
Self Control Test

15th week:
Lecture: 43. Summary of laboratory methods
Practical: Immunoassay

Requirements

Clinical Biochemistry - Participation on practicals:
Attendance of practicals is obligatory. Altogether one absence in the first semester and two absences in the second semester are permitted. In case of further absences, the practicals should be made up for by attending the practicals with another group in the same week, or a medical certificate needs to be presented. Please note that strictly only a maximum of 3 students are allowed to join another group to make up for an absence.

Requirements for signing the Lecture book: The Department may refuse to sign the Lecture book if the student is absent from practicals more than allowed in a semester.
Assessment: At the end of the first and second semester there is a written examination (test) assessed by a five grade evaluation.

Requirements for examinations:
The examination is based on the lecture and practical material (Practicals in Laboratory Medicine, eds.: János Kappelmayer and László Muszbek, 2010) as well as the relevant chapters from the textbook of Marshall and S.K. Bangert: Clinical Chemistry (7th edition, 2012).

Department of Pharmaceutical Chemistry

Subject: **PHARMACEUTICAL CHEMISTRY PRACTICE II.**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Short introductory practice.

2nd week:
Practical: Methanol impurity in ethanol; analysis of the Meristine tablet; allopurinol, hexachlorophene

3rd week:
Practical: Analysis of the sulfa drugs, trimethoprim, chloramphenicol.

4th week:
Practical: Coffein, theobromine, theophylline. Analysis of the Antineuralgica tablet.

5th week:
Practical: Analysis of china alkaloids, drotaverin, papaverin.

6th week:
Practical: Investigation of the Boron-Zinc ointment; investigation of Pulvis Chinacisalis

7th week:
Practical: Analysis of Suppositorium analgeticum. Injectio algopyrini.

Requirements

See the requirements in the first semester.

Subject: **PHARMACEUTICAL CHEMISTRY THEORY II.**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: Local anesthetics: natural compounds. Synthetic substances: esters, amides, ketones, ethers, urethanes and amidines. Spasmolytics: papaverin and its analogues. Bencyclan.

2nd week:
Lecture: Cardiovascular drugs. Antianginal compounds: nitrit- and nitrate esters. B-Adrenergic receptor-blocking agents. Inhibitors of the calcium channel, calcium antagonists. Another coronary dilators. Cardiotonics: cardial glycosides. Another types of cardiotonics. Antiarrythmic agents.

3rd week:
Lecture: Compounds controlling the blood pressure. Antihypertensives, hypotensives. Agents with central attack. Beta-receptor blockers, beta-adreno-receptor antagonists, adrenergic neuron-blockers. Vasodilators. Ganglionic blocking agents. Inhibitors of the angiotensin-converting enzyme. Peripheral dopamine-receptor agonists. Selective dilators of the cerebral blood-vessels. Anticoagulants.

4th week:
Lecture: Medicines of the hyperlipoidemia: clofibrate, nicotinic acid, lovastatin. Compounds effective on the hematopoiesis. Plasma substitutes. Substances effective on the hemostasis: anticoagulants, antithrombotics, inhibitors of platelet aggregation. Coagulants, derivatives of vitamin K. Fibrinolysis inhibitors.

5th week:
Lecture: Diuretics: xanthin and uracyl derivatives. Inorganic mercury salts. Sulfonamides, amino acids, cyclic amidines, aldosteron antagonists. Osmotic diuretics. Laxatives, choleretics. Antacid agents and obstipants.

6th week:
Lecture: Non-steroid anti-inflammatory agents: salicylates, arylalkanoic acids, N-arylanthranylic acids, 5-pyrazolone-derivatives. Antirheumatic agents: compounds of gold. 4-Amino-quinolines, thiols. Anti-gouty agents. Medicines of the immune system: immunostimulants. Immunosupressive agents. Vitamins.

7th week:
Lecture: Steroid hormones. Androgenes, anabolics, anti-androgenes. Oestrogenes, gestogenes, anticonceptives. Corticosteroids: mineralo- and glucocorticoids. Agents effective on the thyroid dysfunction. Antidiabetics. Prostaglandins.

8th week:
Lecture: Inorganiv and organic antiseptic agents, disinfectants. Alcohols, phenols, N-chloro compounds, surface active agents, dyes. Synthetic antibacterial agents. Sulfonamides, nitrofuran derivatives.

9th week:
Lecture: Fluoroquinolones. Antifungal compounds: imidazoles, triazoles, Antifungal antibiotics: polyenes, griseofulvin.

10th week:
Lecture: Antibacterial antibiotics.Cyclopeptides, lipo- glyco- and depsipeptides. Beta-lactam antibioics. Penicillins: natural and semi-synthetic penicillins. Beta-lactamase inhibitors.

11th week:
Lecture: Natural and semi-synthetic cephalosporins. Carbacephems. Monocyclic B-lactams.

12th week:
Lecture: Aminocyclitol (aminoglycoside) antibiotics. Macrolide antibiotics, erythromycin and semisynthetic derivatives. Ansa-macrolides. Natural and semi-synthetic tetracyclins.

13th week:
Lecture: Medicines of the parasitic diseases. Antimalarial agents: quinine and other derivatives. Antiprotozoal agents. Medicines of toxoplasmosis and amoebiasis. Trichomonacide and trypanocidal substances. Anthelminics.

14th week:
Lecture: Antiviral compounds: Acyclovir, Ribavirin, Zidovudin. Neuraminidase inhibitors Antineoplastic agents: cytostatic compounds. Folic acid-, purin-, and pyrimidin-antagonists. Nucleoside antagonists.

15th week:
Lecture: Biological alkylating compounds: nitrogen and phosphamide-mustards. Aziridines, methanesul-fonates, diepoxides. Platinum derivatives. Anthracyclineglycosides. Taxol. Targeted chemotherapy, specific kinase inhibitors, use of MAB-based therapy.

Requirements

Attendance to lectures is emphatically recommended. All material covered in lectures is an integral part of the subject and therefore included in the self-control tests and the final exam. Several new concepts and ideas are discussed in the lectures only and are not present in the textbook. Final examination is possible only after successfully finished and accepted laboratory practices 1+2.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY PRACTICE III. (INDUSTRIAL PRACTICE II.)**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Dialysis. Solutions for dialysis. perfusion solutions. Eye drops. Eye creams.

2nd week:
Practical: Sol. pro dialys. perit. I. (Ph.Hg.VII.), Sol. anticoag. "ACD" (Ph.Hg.VII.)

3rd week:
Practical: Collins "C" oldat. Kardiostop I. oldat

4th week:
Practical: Oculogutt. neomycin. (FoNo.VII.). Oculent. simplex (Ph.Hg.VII.). Oculent. hydrosum (Ph.Hg.VII.). Oculent. neomyc. FoNo VII.

5th week:
Practical: Test from infusions and eye preparations.

6th week:
Practical: High-shear granulation.

7th week:
Practical: Fluid bed granulation.

8th week:
Practical: Hard gelatin capsules, capsule filling and pharmacopoeial tests.

9th week:
Practical: Tablet compression, process parameters and tablet qualification.

10th week:
Practical: Test from tabletting.

11th week:
Practical: Semisolid dosage forms '3. Suspension type ointments Pastes. Formulation techniques, equipment.

12th week:
Practical: Solid dosage forms '1. Combined suppository bases. Aims and formulation techniques, equipment.

13th week:
Practical: Solid dosage forms '2. Suppository formulation in industrial scale. Aims and formulation techniques, equipment.

14th week:
Practical: Cosmetics. Aim, possibilities and formulation techniques, equipment.

15th week:
Practical: Quality control tests, assessment of practice results.
Self Control Test

Subject: **PHARMACEUTICAL TECHNOLOGY PRACTICE III. (PRESCRIPTION WRITING III.)**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Course: Prescription Pharmacy Introduction, general information. Labour safety, laboratory regulations. Requirements. Preparations of pastes. 1. Pasta boraxata FoNo VII. 2. Pasta Burowi FoNo VII. 3. Sirupus kalii chlorati FoNo VII. Course: Sterile and aseptic formulations Parenteral nutrition. Dialyzing. Peritoneal dialysis. Solutio pro dialysi peritoneale I. (Ph.Hg VII.) Solutio pro dialysi peritoneale II. (Ph.Hg VII.)

2nd week:
Practical: Course: Prescription Pharmacy Vaginal dosage forms (ovulum, globulus, globulus vaginalis longiformis), Preparation of suppositories by the help of cold compression with Theobroma oil. 1. Ovulum nystatini FoNo VII. 2. Globulus glycerini boraxati FoNo VII. 3. Globulus zinci sulfurici (individual composition) ($ZnSO_4$ 1,60g; Butyrum cacao 10,0g; for 4 globuli). Course: Sterile and aseptic formulations Cytostatic infusion solutions. Perfusion solutions. Collins solution. Kalium dihydrogenphosphoricum 2,05g. Glucosum anhydricum 25,0g. Magnesium sulfuricum 7,4g. Procainium chloratum 0,1g. Aqua dest. pro inj. ad 500ml. Collins I.solution (SZOTE). Kalium dihydrogenphosphoricum 2,05g. Kalium hydrophosphoricum 9,70g. Kalium chloratum 1,12g. Natrium hydrogencarbonicum 0,84g. Aqua dest. pro inj. ad 1000ml.

3rd week:
Practical: Course: Prescription Pharmacy Divided powders. 1. Pulvis antidoloricus FoNo VII. 2. Pulvis asthmalyticus fortis FoNo VII. 3. Pasta contra solarem FoNo VII. 4. Cremor aquosus FoNo VII. Course: Sterile and aseptic formulations Plasma substitute infusion solutions. Cardiostop solutions. Cardiostop I. solution. Natrium chloratum 0,4g. Kalium chloratum 0,3g. Magnesium chloratum sol. 50% 0,3g. Glucosum anhydricum 1,5g. Mannitum 20,6g. Aqua dest. pro inj. ad 500,0ml. Solutio anticoagulans ACD(Ph.Hg.VII.).

4th week:
Practical: Course: Prescription Pharmacy Incompatibilities. 1. Incompatibility 1. 20,0g 2. Incompatibility 2. 150,0g 3. Incompatibility 3. 100,0g 4. Incompatibility in suppository. (Codein. 0,24g; Aspirin 3,00g, Phenacetin 3,00g, Adeps solidus 3 instead of Adeps solidus 50) Course: Sterile and aseptic formulations, Ophthalmic ointments, Oculentum simplex Ph.Hg.VII. 50,0g, Oculentum hydrosum Ph.Hg.VII 20,0g, Oculentum neomycini FoNoVII 10,0g

5th week:
Practical: Course: Prescription Pharmacy Sparsorium. 1. Sparsorium antisudoricum FoNo VII. 2. Sparsorium contra pruritum FoNo VII. 3. Incompatibility 4. 30,0g (ointment) 4. Incompatibility 5. 10p.(powder) Course: Sterile and aseptic formulations. Test.

6th week:
Practical: Course: Prescription Pharmacy Test 1. Course: Formulation of tablets and granules. Repetition: Tablets and granules. Preparation: Tabletta aminophenazoni.

7th week:
Practical: Course: Prescription Pharmacy 19. Incompatibility 6. (talc) 20. Sparsorium infantum FoNo VII. 21. Pasta antirheumatica FoNo VII. 22. Pulvis combinatus FoNo VII. Course: Formulation of tablets and granules. Tableting. Quality control of tablets. Preparation: Tabletta coffeini.

8th week:
Practical: Course: Prescription Pharmacy 23. Suppositorium algopyrini FoNo VII. 24. Unguentum infantum FoNo VII. 25. Pulvis chinacisalis cum vitamino C FoNo VII. 26. Suspensio bismogeli FoNo VII. Course: Formulation of tablets and granules. Quality control of tablets and granules.

9th week:
Practical: Course: Prescription Pharmacy 27. Suppositorium ad nodum FoNo VII. 28. Unguentum anaestheticum FoNo VII. 29. Cremor erythromycini FoNo VII. 30. Pulvis spasmalgeticus FoNo VII. Course: Formulation

of tablets and granules. Quality control of tablets. Individual and average weight. Test of disintegration. Test of mechanical hardness.

10th week:
Practical: Course: Pharmacy Prescriptions in clinical practice 31. Solutio cacisali 32. Globulus with chamomillae 33. Ointment for hands 34. Mucilage for urine tract. Course: Formulation of tablets and granules. Test.

11th week:
Practical: Course: Prescription, Pharmacy Individual drug preparation practice. Course: Galenic preparations and their manufacture. Preparation and investigation of ointments and creams.

12th week:
Practical: Course: Prescription Pharmacy 35. Mixtura pectoralis adde Dionin FoNo VII. 36. Suppositorium antipyreticum pro parvulo FoNo VI. 37. Pulvis paracetamoli cum codeino FoNo VII. 38. Unguentum antirheumaticum FoNo VII. Course: Galenic preparations and their manufacture. Preparation and investigation of suspension ointments and pastes.

13th week:
Practical: Course: Prescription, Pharmacy Test 2. Course: Galenic preparations and their manufacture. Preparation and investigation of suppositories.

14th week:
Practical: Course: Prescription, Pharmacy 39. Unguentum antiphlogisticum pro infante FoNo VII. 40. Unguentum ichthyolsalicylatum FoNo VII. 41. Pulvis cholagogus FoNo VII. 42. Unguentum dermophylicum FoNo VII. Course: Galenic preparations and their manufacture. Preparation and investigation of powders.

15th week:
Practical: Course: Prescription, Pharmacy Supplemental practice. Consultation. Correction. Course: Galenic preparations and their manufacture. Test.

Requirements

Attendance of practicals is obligatory. Beside pharmaceutical technology practice students have Tabletting, Infusion and Galenic preparation practice. Altogether two absences in the semester is permitted. After absence the practical should be made up. Students write short tests in most practices and 2 summery tests from pharmaceutical technology practice. Also they write final tests from Tabletting, Galenic preparation and Infusion practices. The students have only one more chance to improve the summery test if the grade is fail. At the end of the semester students get 5-stage practical grade. This final grade will contain the marks from pharmaceutical technology practice, tabletting, infusion and galenic preparations.

Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student is absent from the practicals more than allowed in a semester.

Subject: **PHARMACEUTICAL TECHNOLOGY THEORY III.**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Powders. Methods of disintegration. Special thematic for the measurement of powder-technology, rotation properties, particle size, particle distribution, particle form, density, special surface, porosity, water content. Dusting powder.

2nd week:
Lecture: Tablets. Definitions, grouping, requirements. Methods of pressing. Manifestations that occur during pressing. (bounding mechanisms, energy conditions)

3rd week:
Lecture: Granules. Theoretical bases of the formulation of granules. Types of bandage. Modes for the formulation of granules. Dry and wet granulation. Structure granulation. Granulation with fluidization.

4th week:
Lecture: Ingredients of tableting and granulation. (Diluents, desintegration agents, binders, adsorption agents, moisture maintain agents, hydro-phylizating agents, glidant, lubricant, antiadhesion agents, antistatic agents, dyes, colouring agents.). Investigation of tablets and granules.

5th week:
Lecture: Dragée. The process of coating. The methods of coating (sugar coating, film coating, gastric coating, enteric coating.). Dry coating.

6th week:
Lecture: Formulation of dragée by fluidization. Equipment for coating. Dragée core and the temperature of drying. Investigations of dragée.

7th week:
Lecture: Capsules. Hard gelatine capsules. Soft gelatine capsules, formulation, filling. Intestinosolvent capsules. Wafer-capsules. Investigation of capsules.

8th week:
Lecture: Microcapsulation. (molecular capsulation), nanocapsulation, liposomes, structure of liposomes, ormulation of liposomes. Pharmaceutical liposomes. Cosmetics.

9th week:
Lecture: Pharmaceutical dosage forms formulated by extraction. Basic requirements of extraction. Factors influenced by extraction. Methods of extraction. (Maceration, turbo-extraction, hydro-extraction, perfusion extraction, extraction with reverse flow.) Extracts, tinctures. Decoctions, Infusions. Tea-mixtures. Proper formulation method of therapeutic teas.

10th week:
Lecture: Homeopathic preparations and pharmaceutical forms. What is a homeopathic drug? Homeopathic pharmaceutical bases, drug-transfers and ingredients. Preparations. Guides for the formulation of homeopathic preparations. OGYI. Important preparations. A:U:V:

11th week:
Lecture: Bandage. Bases of bandage (cellulose, polimer, intermediate agents). Covering injuries, the material of bandage. Cotton wool. Fixing bandage and it's material. Investigation of bandage.

12th week:
Lecture: Primer packing materials. Describing primer packing materials and containers.: glass, plastic. Investigations. Special packing materials.

13th week:
Lecture: The connection between drug formulation and technological chemistry.

14th week:
Lecture: Consultation.

15th week:
Lecture: Consultation

Requirements

Attendance of practicals is obligatory. Altogether two absences in the semester is permitted. After absence the practical should be made up. Students write short tests in most practices and 2 summery tests. This short test will contain measurement conversions and latin words and phrases. The summery tests will contain the knowledge of Pharmaceutical Technology practicals. The students have only one more chance to improve the summery test if the grade is fail. At the end of the semester students get 5-stage practical grade. This final grade will be the average of 2 summery tests and the grade of short tests.
Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student is absent from the practicals more than allowed in a semester.

Faculty of Pharmacy

Subject: **PUBLIC PHARMACY PRACTICE AFTER 3RD YEAR (PREPARATION OF PHARMACEUTICAL DOSAGE FORMS, MANAGEMENT-QUALITY ASSURANCE, DISPENSING, PHARMACEUTICAL BUSINESS ADMINIST)**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **120**

Requirements

Syllabus for the practice in a public pharmacy after third year
Duration of practice: 4 weeks, 8 hours daily, from which 2 hours may be spent preparing individually The student is required to gain proficiency in the following areas during his /her practice at a public pharmacy, and subsequently acquire knowledge about pharmacy operation including dispensing medication, preparing medication, validation and quality assurance, and the overall operation of the pharmacy.

Requirements for the student: Accept and sign the non-disclosure document. Absence from practice must be authentically justified based on the rules of the place of training. Absences must be made up. He/she is expected to follow the guidance of the pharmacist in charge of the training. Skills expected from the student after the completion of practice:
• practical application of the theoretical knowledge obtained during his / her studies
• he / she is expected to know the premises and the assets of the public pharmacy and be able to get information from manuals and scientific journals used during his / her work
• he / she is expected to learn about the work activities of a public pharmacy
• he / she is required to have an appropriate working relationship with the co-workers at the pharmacy
• he / she is expected to know the rules and regulations pertaining to the operation of pharmacies
• he/ she is required to explore the possibilities of communicating with patients The student's tasks during the practice: Under the supervision of the pharmacist in charge of the training he / she participates in the following activities:

1. Preparation of medicine. In the process he / she is required to learn: How to prepare magistral / individual formulations according to the rules and to recognize incompatibilities The legal possibilities of changing the original prescription The rules of labelling and their application

(identifiability of manufacturer and patient, application, administration, shelf-life) Documentation of preparation, and administrative obligations Storage of materials, processing of basic formulations and subsequent administrative obligations Formulations of the compendium and FoNo

2. Operation and quality assurance. In the process he / she is required to learn
• administrative work in the pharmacy
• standard procedures for workflow
• how to check and document workflow
• the rules pertaining to the examining and sampling incoming medications, documentation of examinations

3. Drug dispense. In the process he / she is required to learn
• how to check the content and layout of the prescription
• the database of nutrition complements and medicinal formula
• adequate application of the computer program. He / she is expected to get acquainted with the process and documentation of drug dispensing, and communication with patients
• the notion of pharmacy care and its practical ramifications

4. Medicine ordering. In the process he / she is required to learn:
• how to order medicine • about narcotics and activities involving their handling
• the rules pertaining to hazardous waste Evaluation: Keeping an electronic notebook: description of 1 syllabus-related practical problem in half / one page. The pharmacist in charge of the training checks the work and description every second week and evaluates it using a five-grade system. He /She sends the electronic notebook to the Dean's Office according to the rules of the place of training. At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place. Student evaluation: After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

CHAPTER 19
ACADEMIC PROGRAM FOR THE 4TH YEAR

Department of Biopharmacy

Subject: **PHARMACEUTICAL BIOANALYTICS AND BIOTECHNOLOGY I.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Modern biotechnology (history, basic concept)

2nd week:
Lecture: Biotechnology methods and biotechnology products in therapy

3rd week:
Lecture: Production of biotechnological drugs I.: fermantation

4th week:
Lecture: Production of biotechnological drugs II..: recombinant technology, GMO

5th week:
Lecture: Gene technology I.: GH, insulin, enzymes, mABs, cytokines

6th week:
Lecture: Gene technology II.: vaccines, antibiotics

7th week:
Lecture: Gene technology III.: gene therapy, personalized medication
Self Control Test

8th week:
Lecture: Gene technology IV.: stem cells, stem cells in therapy, cell banks.

9th week:
Lecture: Gene technology V.: pharmaco genetics, pharmaco genomics, HGP, ENCODE project

10th week:
Lecture: Modern drug delivery systems, nano and biotechnology based therapies.

11th week:
Lecture: Biotechnology based targeted (cancer) therapies

12th week:
Lecture: Industrial production: documentation, QA, QC, validity

13th week:
Lecture: Regulation, biosimilar products, FDA/EMA regulation

14th week:
Lecture: Ethics od biotechnology, future directions.

15th week:
Lecture: Self Control Test
Self Control Test

Requirements

At least 30 % of the lectures must be visited. Students have to write two control test, on 7th, and 15th week. If the results of the tests will not be at least 60%, the students will not be able to take

End of Semester Exam (ESE).
At the end of the semester from Pharmaceutical Biotechnology and Bioanalitics students take ESE which is oral.

Department of Medical Microbiology

Subject: **MEDICAL MICROBIOLOGY I.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**
Seminar: **10**
Practical: **10**

1st week:
Lecture: The microbial word. Pharmaceutical importance of microbes. Prokaryotic cell structure.
Practical: Laboratory safety instructions. Bacterial normal flora. Collection of clinical samples, sample processing.

2nd week:
Lecture: Morphology and physiology of bacteria. Pathogenesis and infection. Bacterial genetics.
Practical: Examination of microscopic morphology of bacteria. Microscopic techniques (dark field and phase contrast microscope, electron microscopy). Unstained specimens. Staining methods (Gram-, Ziehl-Nielssen-and Neisser- staining).

3rd week:
Lecture: Host defenses against bacterial infections. Immunological basis of vaccination.
Practical: Culture techniques (culture conditions, media, colony morphology). Identification of bacteria (examination of biochemical activity). Diagnosis of anaerobic infections.

4th week:
Lecture: Passive and active immunization. Immunoglobulins. Vaccines.
Practical: Immunoserological methods in microbiological diagnosis (precipitation, agglutination, complement fixation, ELISA and western-blot).. Molecular diagnostic methods.

5th week:
Lecture: Principles of antibacterial chemotherapy, major groups of antibiotics and their mechanism of action. Mathematical description of the antibiotic effect. Antibiotic policy.
Practical: Methods for testing antibiotic susceptibility. Examination of antibiotic interactions.

6th week:
Lecture: Gram-positive cocci and rods. Gram-negative cocci. Acid-fast bacteria
Practical: Development and clinical trial of antibiotics.

7th week:
Lecture: Gram-negative coccobacilli. Gram-negative rods. Curved rods.
Seminar: Diagnosis of enteric bacterial infections.

8th week:
Lecture: Mycoplasms and obligatory intracellular bacteria. Spirochaetes.
Seminar: Bacterial respiratory infections. Antituberculotic agents.

9th week:
Lecture: Cell wall synthesis inhibitors.
Seminar: Bloodstream infections. Bacterial meningitis.

10th week:
Lecture: Protein synthesis inhibitors.
Seminar: Urinary tract infections. Bacterial sexually transmitted diseases (STD)

11th week:
Lecture: Antibiotics interfering with nucleic acid metabolism and antimetabolite antibiotics.
Seminar: Antibacterial agents for the treatment of meningitis and urinary tract infections. Antibiotics against anaerobic bacteria.

12th week:
Lecture: Fungal cell structure, physiology, virulence.
Seminar: Types and mechanisms of clinically relevant antibiotic resistance.

13th week:
Lecture: Antifungal agents. Medically important fungal pathogens.
Seminar: Diagnosis of fungal infections.

14th week:
Lecture: Normal flora. Pre-, pro- and synbiotics.
Seminar: Antimicrobial agents in clinical practice.

15th week:
Lecture: Consultation.
Seminar: Consultation.

Requirements

Participation in the practical courses and seminars is obligatory. The Department may refuse to sign the students' Lecture book if they are absent from more than two practices or seminars in a semester.
At the end of 1st semester the student is required to take an end-semester examination based on the whole material of the lectures, practices and seminars of the semester. The examination consists of a written test and an oral examination.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY THEORY IV.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Biopharmaceutical requirements during planning and evaluating pharmaceutical dosage forms. Basic principles, definitions. LADMER-model. Basic principles of pharmacokinetics. Kinetic of adsorption and elimination. Biological half-time. Anatomical and physiological investigation of resorption. Resorption.

2nd week:
Lecture: Bioavailability and bioequivalence. Definitions. Definition of bioavailability (basic principles and possibilities). Possibilities for influencing bioavailability with instruments used in pharmaceutical technology.

3rd week:
Lecture: Physical and physicochemical properties of the active agent, distribution coefficiens, lipophylia, value of pK, dissolution and speed of dissolution, the influence of particle size, polimorphous, salt, prodrug, chemical stability of active agent, the influence of ingredients.

4th week:
Lecture: Formulation process, influence on drug formulation. Other possibility for influencing bioavailability/physiological facts, drug interactions, influence of food-products: first-pass effect, pathological states.

5th week:
Lecture: In vitro methods for the release of active-agents. Correlation between in vitro/in vivo methods. Investigations of drug release, instruments.

6th week:
Lecture: Retard and depot drug forms. Definitions. Therapeutic aims. Biopharmaceutical bases. Criteria for the active agents of depot drug-forms. Processes for lengthening the effective time of active agents. Therapeutic processes, chemical processes, technological possibilities.

7th week:
Lecture: Retard oral preparations. Pharmacokinetical bases of planning oral retard preparations. Planning of drug preparations with the dissolution of null and first order. Controlling the bioavailability and bioequivalence of retard oral preparations.

8th week:
Lecture: Depot parenteral preparations. Solutions, suspensions, emulsions, implants.

9th week:
Lecture: Therapeutic systems: basic principles. Local therapeutic systems. Transdermal therapeutic systems. Oral therapeutic systems, parenteral therapeutic systems.

10th week:
Lecture: Pharmaceutical dosage forms of the future. Development tendencies. Organ specific transport of the pharmaceutically active agents. Drug targeting. Development of drug formulations, controlled release of the active agent. Optimizing the available drug preparations. New methods of administration.

12th week:
Lecture: Veterinary preparations. Veterinary FoNo. Special veterinary drug forms.

13th week:
Lecture: Modern drug forms I. Drugs with fluid-crystals. Therapeutic nail polish. Microemulsions as the new transporter systems for active agents. Formulation of parenteral microemulsions. V/o/v emulsions in cosmetics.

14th week:
Lecture: Modern drug forms II. Nanoparticles. Solid nanoparticles. Lipidprodrug and pharmacosom. Nanosuspensions. Polimeric submicron emulsions as systems for drug-transport.

15th week:
Lecture: Consultation.

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control tests and the final exam.

Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn’t attend 30% of lectures.

Subject: **PHARMACEUTICAL TECHNOLOGY PRACTICE IV. (INDUSTRIAL PRACTICE III.)**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Practical: **45**

1st week:
Practical: Injections

2nd week:
Practical: Injectio natrii chlorati 100 mg/ml (Ph.Hg.VII.). Injectio kalii chlorati 100 mg/ml (Ph.Hg.VII.)

3rd week:
Practical: Sterilization method in Autoclave.

4th week:
Practical: Injectio aethylmorphinii chlorati 20 mg/ml. Injectio acidi ascorbici 10%. Injectio procainii chlorati 20 mg/ml (Ph.Hg.VII.). Injectio atropinii sulfurici 1 mg/ml (Ph.Hg.VII.)

5th week:
Practical: Injection Test.

6th week:
Practical: Industrial production of granules and tablets, Pharmacopoeial tests, dissolution tests

7th week:
Practical: Oral modified and controlled release tablets, theory and production.

8th week:
Practical: Pan coating, theory and practice, excipients and steps of sugar coating.

9th week:
Practical: Fluid bed coating.

10th week:
Practical: Test from tableting.

11th week:
Practical: Biotechnology 1

12th week:
Practical: Biotechnology 2

13th week:
Practical: Biotechnology 3

14th week:
Practical: Biotechnology 4

15th week:
Practical: Test from biotechnology

Requirements

Attendance of practicals is obligatory. Students have Tabletting, Infusion and Galenic preparation practice during this semester. Altogether two absences in the semester is permitted. After absence the practical should be made up. Students write final tests from Tabletting, Galenic preparation and Infusion practices. The students have only one more chance to improve the test if the grade is fail. At the end of the semester students get 5-stage practical grade. This final grade will be the average of the tests from tabletting, infusion and galenic preparations.

Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student is absent from the practicals more than allowed in a semester.

Department of Pharmacology

Subject: **PHARMACEUTICAL AND BIOANALYTICAL CHEMISTRY I.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**
Seminar: **15**

1st week:
Lecture: Introduction, the role of analytical and bioanalytical chemistry in pharmaceutical and medical sciences.

2nd week:
Lecture: Sampling and sample preparation, preparation of applied materials and labor-wares.

3rd week:
Lecture: Molecular spectroscopy I.: Basics and application of UV-VIS spectrophotometry in drug metabolism and bioanalytics.

4th week:
Lecture: Molecular spectroscopy II.: Base principles and application of IR spectroscopy in pharmaceutical sciences.

5th week:
Lecture: Electro- and thermoanalytical techniques in the bioanalytics and drug manufacturing industry.

6th week:
Lecture: Basics and application of Radio-analytical techniques in the medical diagnosis and research.

7th week:
Self Control Test

8th week:
Lecture: Chromatographic separation I.: basic principles of chromatography, chromatographic techniques VRK, 2D VRK, affinity chromatography, column chromatography.

9th week:
Lecture: Chromatographic separation II.: Basic principles and application of GC, HPLC and IMER in drug metabolism, drug development and pharmaceutical industry.

10th week:
Lecture: Chromatographic separation III.: CE, OPLC and UTLC principles and application in the pharmaceutical, medical and health sciences

11th week:
Lecture: Mass spectrometry (MS) I.: Basic principles, MS instruments (ion sources, analyzers, detectors, vacuum system).

12th week:
Lecture: Mass spectrometry (MS) II.: Basic rules, spectral interpretation, MS applications.

13th week:
Lecture: Hyphenated methods I.: GC- and HPLC-MS principles and application in the pharmaceutical, medical and health sciences.

14th week:
Lecture: Hyphenated methods II.: CE- and MS-MS. Basic principles and application in the bioanalytical chemistry.

15th week:
Self Control Test

Requirements

At least 30 % of the lectures must be visited. Students have to write each of the two control tests.

The results of the tests will be summarized and the average value of them will give the result of the 'A' exam. In the case of the 'A' result fail (1) the next exam automatically will be considered as a 'B' exam.

Subject: **PHARMACOLOGY PRACTICE I.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction to pharmacology.

2nd week:
Practical: Receptors and signal transduction.

3rd week:
Practical: Neurotransmission and neurotransmitters in the CNS.

4th week:
Practical: General anesthetics.

5th week:
Practical: Sedatohypnotics. Antidepressants and lithium. Antipsychotics.

6th week:
Practical: Antiepileptics.

7th week:
Practical: Pharmacologic management of Parkinsonism.

8th week:
Practical: Drugs used in Alzheimer's Disease.

9th week:
Practical: Migraine.

10th week:
Practical: Central and peripheral skeletal muscle relaxants.

11th week:
Practical: Drugs with important actions on smooth muscle. Local anesthetics.

12th week:
Practical: Basic pharmacology.

13th week:
Practical: Cholinerg-activating and cholinoceptor-blocking drugs.

14th week:
Practical: Adrenoceptor-activating and blocking drugs.

15th week:
Practical: General consultation on the curriculum of the first semester

Requirements

During the semester students have to take two exams. Requirements for the signature of the Lecture Book for the semester are at least a pass (2) on both exams.

Attendance at seminars is compulsory: the signature may be refused in the case of absences from more than four seminars. Signature is compulsory for the student to be allowed to take the End of Semester Exam (ESE).
The average of the two mid-semester exams provides the grade of the Assessment of Workmanship (AW5) for the Pharmacology I. practice. In case the student does not reach a pass (2) on both mid-

semester exams, the signature of the lecture book is refused, and the student fails the semester. In case the student does not reach a pass (2) on one of the mid-semester exams, the student must take a correction exam from all the topics of the semester on the last week of the semester. The grade of the correction exam will be averaged with the two mid-semester exams and this average will give the grade of the AW5 for the Pharmacology I. practice. Further correction of this AW5 grade is not an option.

Subject: **PHARMACOLOGY THEORY I.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: Introduction to pharmacology of CNS drugs. Neurotransmission and the CNS. General anesthetics.

2nd week:
Lecture: Opioid analgesics and antagonists.

3rd week:
Lecture: Drugs of abuse.

4th week:
Lecture: Sedatohypnotics.

5th week:
Lecture: Antidepressants II and lithium. Antipsychotics.

6th week:
Lecture: Antiepileptics.

7th week:
Lecture: Pharmacologic management of Parkinsonism

8th week:
Lecture: Drugs used in Alzheimer's Disease

9th week:
Lecture: Pharmacology of ANS drugs

10th week:
Lecture: Migraine. Skeletal Muscle Relaxants.

11th week:
Lecture: Drugs with important actions on smooth muscle. Local anesthetics.

12th week:
Lecture: Basic pharmacology

13th week:
Lecture: Cholinerg-activating drugs.Cholinoceptor-blocking drugs.

14th week:
Lecture: Adrenoceptor-activating drugs. Adrenoceptor-blocking drugs.

15th week:
Lecture: Pharmacology of eye.

Requirements

During the semester students have to take two exams. Requirements for the signature of the Lecture Book for the semester are at least a pass (2) on both exams.

Attendance at seminars is compulsory: the signature may be refused in the case of absences from more than four seminars. Signature is compulsory for the student to be allowed to take the End of

Semester Exam (ESE).
At the end of the semester from Pharmacology I. theory students take End of Semester Exam (ESE) which is oral. Students draw 3 exam titles from the topics of the first semester.
During the semester there is an opportunity to be freed from the constraint of the End of Semester Exam. Without taking the exam, students are offered the grade calculated from the two exams passed during the semester if it is at least good (4) or excellent (5). Correction of the offered grade is in the form of taking the oral End of Semester Exam instead. The result of the exam can be better or even worse than the offered grade.

Department of Preventive Medicine, Faculty of Public Health

Subject: **PREVENTIVE MEDICINE AND PUBLIC HEALTH**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**
Seminar: **22**
Practical: **8**

1st week:
Lecture: 1. The history, scope and methods of public health and preventive medicine, major public health issues in developing and developed countries 2. Introduction to human ecology
Seminar: 1-2. Principles of prevention

2nd week:
Lecture: 3. Air pollution and health4. Water pollution and health
Seminar: 3-4. Demographic methods to study the health status of the population

3rd week:
Lecture: 5. Health effect of the occupational environment. I. Physical hazards 6. Health hazards of ionising radiation and radioactive substances
Seminar: 5-6. Occupational health and safety in pharmacist practice.

4th week:
Lecture: 7. Health effects of the occupational environment. II. Toxicology of inorganic industrial toxicants 8. Health effects of the occupational environment. III. Toxicology of organic solvents and pesticides
Practical: 7-8. Chemical and microbiological examination of drinking water (laboratory practice for small groups)

5th week:
Lecture: 9. The general effect of environmental pollution 10. Lifestyle and health
Practical: 9-10. Chemical and microbiological examination of drinking water (laboratory practice for small groups)

6th week:
Lecture: 11. Healthy nutrition. Nutritional deficiency disorders 12. Food poisoning
Seminar: 11-12. Mercury toxicity, case study

7th week:
Lecture: 13. Public health consequences of substance abuse14. Social factors and health
Seminar: 13-14. Health promotion

8th week:
Lecture: 15. Epidemiology of respiratory diseases16. Epidemiology of skeletal and dental diseases I
Seminar: 15-16. Health education

9th week:
Lecture: 17. Public health problems of disadvantaged people18. Introduction into the general epidemiology of non-communicable

diseases
Seminar: 17-18. Epidemiological measures

10th week:
Lecture: 19. Epidemiology of neoplastic diseases20. Epidemiology of cardiovascular diseases
Seminar: 19-20. Epidemiological studies

11th week:
Lecture: 21. Epidemiology of skeletal and dental diseases II22. General epidemiology of communicable diseases
Seminar: 21-22. Preventive strategies

12th week:
Lecture: 23. Epidemiology of respiratory infectious diseases24. Infection control and pharmacy
Seminar: 23-24. WHO/HFA database

13th week:
Lecture: 25. Communicable diseases transmitted through the skin 26. Epidemiology of sexually transmitted diseases and AIDS
Seminar: 25-26. Reporting and control of communicable diseases, vaccination

14th week:
Lecture: 27. Epidemiology of viral hepatitis28. Health policy principles
Seminar: 27-28. Sterilization and disinfection

15th week:
Lecture: 29. Health care systems of developed countries 30. Needs, demands and use of health services
Seminar: 29-30. Central Sterilization Unit of the Medical University (visit)

Requirements

Requirements for signing the lecture book
Attendance of lectures is highly recommended. Attendance of the seminars, practices and visits is obligatory. The head of the department may refuse to sign the lecture book if a student is absent more than two times from seminars (including visits) in the semester even if he/she has an acceptable excuse.

Requirements for the final exam
The final exam involves written and oral sections covering the topics of all lectures and seminars of the subject. The oral exam covers the topics of all seminars and practices of the semester. The written exam consists of multiple choice test questions related to Environmental Health, Epidemiology and Health Policy. The final exam is assessed on the basis of the average of four marks and it is failed if either the oral or any part (Environmental Health, Epidemiology, Health Policy) of the written exam is graded unsatisfactory. Students should repeat only those section(s) of the final exam that has/have been previously unsuccessful. In this case the final exam is graded according to the average of the passing marks obtained on the first and repeated exams.

Course description
The course covers the main areas of public health: environmental health including the health consequences of air and water pollution, occupational and nutritional health; the principles of epidemiology, the epidemiology and control of communicable and non-communicable diseases. Special attention is given on the main topics underlying nutritional disorders and deficiencies, health hazards of pharmacist' practice and preventive strategies.

Requirements
To acquire knowledge about the principles and the most important issues of environmental health,

communicable and non-communicable diseases and health policy.

Methods of education
The education of the subject is based on lectures, seminars, laboratory practices and visits. The practical adaptation of the topics of lectures are highly promoted by seminars. Students will learn about the major public health issues in developing and developed countries and organisation of public health services. The practices are closely related to the environmental health part of the course. During the epidemiology seminars students will learn how to calculate the most important indicators for the measurement of morbidity and mortality. In addition, the epidemiology of communicable and non-communicable diseases will be discussed in detail.

Prerequisite:
immunology, pathology II.

Department of Biopharmacy

Subject: **PHARMACEUTICAL BIOANALYTICS AND BIOTECHNOLOGY II.**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**
Practical: **60**

1st week:
Lecture: Immunoanalytical methods I.: Southern-blotting, Northern-blotting, Western-blotting, dot-blot
Practical: Introduction, laboratory safety instructions.

2nd week:
Lecture: Immunoanalitycal methods II.: RIA, ELISA, IHC.
Practical: Protein isolation

3rd week:
Lecture: Isolation of nucleic acids, types of gel electrophoresis, SCG, DNS-chip, Comet assay.
Practical: Protein isolation

4th week:
Lecture: PCR, RT-PCR: basic principles and practical applications.
Practical: Western-blot

5th week:
Lecture: Synthesis of oligonucleotides and peptides. Sequencing of nucleic acids and proteins.
Practical: Western-blot

6th week:
Lecture: Basic principles of proteomics, applications in medical and pharmaceutical research.
Practical: Isolation of nucleic acids, agarose gel electrophoresis.

7th week:
Lecture: Basics and application in the pharmaceutical research and clinical diagnosis.
Practical: Isolation of nucleic acids, agarose gel electrophoresis.
Self Control Test

8th week:
Lecture: Analytical techniques in clinical diagnosis of selected diseases, laboratory tests.
Practical: Immunohistochemistry.

9th week:
Lecture: Therapeutic Drug Monitoring.
Practical: TLC

10th week:
Lecture: Toxicology. Instrumental analysis of some selected drugs.
Practical: RIA.

11th week:
Lecture: Bioanalysis: the role and importance of bioanalytical experiments in drug research and drug development.
Practical: PCR, RT-PCR.

12th week:
Lecture: Analytical aspects of quality insurance in the pharmaceutical industry.
Practical: ELISA

13th week:
Lecture: Analytical aspects of human drug development.
Practical: GC-MS (demonstration)

14th week:
Lecture: Environmental rules, prescriptions and applied analytical methods and techniques in the pharmaceutical industry.
Practical: Microarray.

15th week:
Lecture: Self Control Test
Self Control Test

Requirements

At least 30 % of the lectures must be visited. Students have to write two control test, on 7th, and 15th week. If the results of the tests will not be at least 60%, the students will not be able to take oral exam.

Obsense of more than one practice is not allowed during the semester. The missed practice can be made up exclusively on the 14th week of the semester. Only students having adequately fulfilled the requirements of practice are allowed to get the signature and to take the final oral exam.

Department of Internal Medicine

Subject: **CLINICAL BASICS**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **65**
Seminar: **30**

1st week:
Lecture: INTERNAL MEDICINE1. Autoimmune diseases.2. Inflammatory lung disease. 3. Asthma bronchiale, chronic bronchitis, emphysaema. 4. Pulmonary tumour.5. Type I, II diabetes mellitus and its treatment.

2nd week:
Lecture: 6. Infective endocarditis and its prevention.7. Anticoagulant treatment in heart diseases.8. Heart failure and pacemaker treatment.9. Angina pectoris. Myocardial infarction. 10. Arrhythmias.

3rd week:
Lecture: 11. High blood pressure. Complication and treatments.12. Urgency in high blood pressure.13. Gallstones and acute chronic pancreatitis. 14. Diseases of hypophysis and adrenals.15. Diseases of thyroid and parathyroid glands.

4th week:
Lecture: 16. Diseases of oral cavity. 17. Disease of oesophagus. Acute, oral chronic gastritis.18. Examination methods of gastrointestinal tract.

Peptic ulcer.19. Metabolic X-syndrome.20. Drug dosage in renal insufficiency and old age.

5th week:
Lecture: 21. Cancer of stomach.22. Inflammatory bowl disease, Crohn disease, ulcerative cholitis. Cholitis indicated by antibiotic treatment. 23. Gluten sensitive enteropathy, irritable colon syndrome.24. Acute hepatitis, chronic hepatitis.25. Hepatic cirrhosis. Obesity.

6th week:
Lecture: 26. Polycythaemai, myelofibrosis, anaemia.27. Myeloma multiplex, Waldenström macroglobulinaemia.28. Kidney function.29. Acute and chronic glomerulonephritis. Autoimmune nephropathies.30. Interstitial nephritis. Acute and chronic renal failure.

7th week:
Lecture: 31. Inherited and acquired haemophilias. 32. Thromboembolism.33. Acute and chronic leukaemia.34. Anaemias.35. Hodgkin and non-Hodgkin lymphoma.

8th week:
Lecture: SURGERY36. Shock, asepsis, antisepsis.37. Pain killing in surgery.38. Oncology – surgery.39. Wounds and healing of wounds. (TRAUMATOLOGY)40. Trauma (TRAUMATOLOGY)

9th week:
Lecture: PEDIATRY41. Nephrology42. Vomiting and diarrhoea in 1st year of life.43. Cardiology44. Haematology45. Neurology.

10th week:
Lecture: 46. Congenital development disorder.47. Growing and mental development in the 1st years of childhood.48. Antibiotic therapy in early age.49. Allergy.50. Respiratory organs diseases in early age

11th week:
Lecture: NEUROLOGY, PSYCHIATRY51. Epilepsy52. Headache.53. Stroke

12th week:
Lecture: 54-55. Cancer of CNS. (NEUROSURGERY)

13th week:
Lecture: 56. Alcohol and drug dependences.57. Depressive and panic diseases.58. Drugs and therapy in psychiatry.

14th week:
Lecture: OBSTETRICS, GYNECOLOGY59. Birth control pills and its side effects. Climax and hormone therapy.60. Pharmacotherapy during pregnancy, side effects.61. Inflammatory diseases of female organs.62. Pharmacotherapy during birth and nursing.63. Evidences based pharmacotherapy.

15th week:
Lecture: 64. Disorders in puberty. Normal pregnancy, prenatal care. 65. Problems of menstruation. Sterility and hormone therapy.66. Benign and malignancy tumour of the female reproductive organs.
Self Control Test

Department of Medical Microbiology

Subject: **MEDICAL MICROBIOLOGY II.**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **15**
Seminar: **15**

1st week:
Lecture: Human pathogenic protozoa I.
Seminar: Antimalarial drugs. Development of malaria vaccine.

2nd week:
Lecture: Human pathogenic protozoa II.
Seminar: Antiprotozoal drugs.

3rd week:
Lecture: Medically important cestodes and trematodes.
Seminar: Antihelminthic drugs I.

4th week:
Lecture: Medically important nematodes.
Seminar: Antihelmintic drugs II. Drugs against ectoparasites.

5th week:
Lecture: General properties of viruses, pathogenesis, replication strategies.
Seminar: Diagnosis of viral infections, culturing, serology.

6th week:
Lecture: Antiviral agents.
Seminar: Determination of susceptibility to antiviral agents.

7th week:
Lecture: Herpesviruses.
Seminar: Treatment and vaccination of herpes infections.

8th week:
Lecture: Hepatitis viruses.
Seminar: Treatment, vaccination and diagnosis of viral hepatitis.

9th week:
Lecture: DNA viruses: Adeno, Parvo, Papilloma, Pox
Seminar: Congenital and neonatal virus infection.

10th week:
Lecture: Medically important RNA viruses.
Seminar: Treatment and vaccination of respiratory viruses.

11th week:
Lecture: Medically important arbo and robo viruses.
Seminar: Diagnosis of enteric viral infections.

12th week:
Lecture: HIV virus
Seminar: Opportunistic infections.

13th week:
Lecture: Prions
Seminar: Microbial control of pharmaceutical products.

14th week:
Lecture: Sterilization and disinfections.
Seminar: Standards of microbial purity of pharmaceutical products.

15th week:
Lecture: Consultation.
Seminar: Consultation.

Requirements

Participation in the practical courses and seminars is obligatory. The Department may refuse to sign the students' Lecture book if they are absent from more than two practices or seminars in a semester. At the end of the 2nd semester the student is required to take a final examination based on the whole material taught in the Medical Microbiology course. The final examination consists of a written test and oral examination.

Department of Pharmaceutical Surveillance and Economics

Subject: **PHARMACEUTICAL MANAGEMENT AND ORGANISATION**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: The surrounding health system around the Hungarian Pharmacy. Drug consuption and sales. The top pharmaceutical companies and their top products, Drug consumption in Hungary in an international comparison.

2nd week:
Lecture: The preclinical and clinical phases of the drug research and development Generics, bioequivalence studies.

3rd week:
Lecture: Health financing and the drug reimbursement system. Pharmacy reimbursement. The structure of the drug prices. Something about quality assurance: GMP, GLP, GCP, GPP.

4th week:
Lecture: Drug utilization, its advantages, the ATC system, DDD, DOT. The wholesalers. The pharmacy sales.

5th week:
Lecture: The legal behind of the Pharmacy system, Drug registration. The roles of the Health Authorities and the National Pharmacy Officer.

6th week:
Lecture: Basics of drug economy and the Evidence Based Medicine. The professional organisations in the Pharmacy system.

7th week:
Lecture: Drug marketing. Life cycle of the drugs. Generics. OTC drugs.

8th week:
Lecture: Drug informations, advertisement, medical and pharmacy representatives. Pharmaceutical Care. Ethical issues in the pharmaceutical care. Ethical Codex. Pharmacovigilance.

Requirements

Concerning attendance of classes, the rules in the Regulations Governing Admission, Education and Examinations of the University of Debrecen are valid.
Conditions of signing the lecture book (by the end of semester): Participation in at least three (3) of 6 interim tests are required for the signature. Those ones who failed will be required to pass the "end of semester test" in order to obtain signatures.
Exam (semifinal, kollokvium)
The exam will be written and oral exam at the end of the semester which covers all the topics of the semester taken in the lectures or seminars. Written part includes a TEST (single choice, multiple choice, short description or definitions, etc.) and an Oral part (Two topics from selected list of questions provided.) Grade (semifinal mark) The average of the three scores (Test, Topic-1 Topic-2) compose the final mark (1-5 grades). Exemption (full or partial) may be earned - only for those student who had at least 5 tests taken successfully during the semester and reached at least 70%.

Department of Pharmaceutical Technology

Subject: **INDUSTRIAL PHARMACEUTICAL TECHNOLOGY**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**
Seminar: **15**

1st week:
Lecture: Treatment of working atmospheres. Filtration of working atmospheres

2nd week:
Lecture: Iso-technology

3rd week:
Lecture: Dissolution. Lyophilization

4th week:
Lecture: Filtration of liquids. Sterilization

5th week:
Lecture: Solid Forms I. Mixing process

6th week:
Lecture: Solid Forms II: Conversion into dosage form.

7th week:
Lecture: Semi-Solid Forms I. Soft gelatin capsules

8th week:
Lecture: Packaging

9th week:
Lecture: Liquid Forms I. Content of liquid forms

10th week:
Lecture: Materials of containers for liquid forms

11th week:
Lecture: Liquid Forms II. Preparation of liquid forms

12th week:
Lecture: Filling of liquid forms. Design of production plants

13th week:
Lecture: Semi-Solid Forms II. Transdermal systems

14th week:
Lecture: Suppositories

15th week:
Lecture: consultation

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam. Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn’t attend 30% of lectures.

Department of Pharmacology

Subject: **PHARMACEUTICAL AND BIOANALYTICAL CHEMISTRY II.**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**
Practical: **60**

1st week:
Lecture: Immunoanalytical methods I.: Southern-blotting, Northern-blotting, Western-blotting, dot-blot
Practical: Introduction, laboratory safety instructions.

2nd week:
Lecture: Immunoanalitycal methods II.: RIA, ELISA, FISH, IHC.
Practical: UV-VIS spectrophotometry

3rd week:
Lecture: Isolation of nucleic acids, types of gel electrophoresis, SCG, DNS-chip, Comet assay.
Practical: Gas chromatography (GC).

4th week:
Lecture: PCR, RT-PCR: basic principles and practical applications.
Practical: High Performance Liquid Chromatography (HPLC).

5th week:
Lecture: Synthesis of oligonucleotides and peptides. Sequencing of nucleic acids and proteins.
Practical: Protein isolation.

6th week:
Lecture: Basic principles of proteomics, applications in medical and pharmaceutical research.
Practical: Western-blot

7th week:
Lecture: 1th control testNMR and ESR: Basics and application in the pharmaceutical research and clinical diagnosis.
Practical: Isolation of nucleic acids, agarose gel electrophoresis.
Self Control Test

8th week:
Lecture: Analytical techniques in clinical diagnosis of selected diseases, laboratory tests.
Practical: Immunohistochemistry.

9th week:
Lecture: Therapeutic Drug Monitoring.
Practical: TLC

10th week:
Lecture: Toxicology. Instrumental analysis of some selected drugs.
Practical: RIA, ELISA.

11th week:
Lecture: Bioanalysis: the role and importance of bioanalytical experiments in drug research and drug development.
Practical: NMR (demonstration).

12th week:
Lecture: Analytical aspects of quality insurance in the pharmaceutical industry.
Practical: ESR (demonstration).

13th week:
Lecture: Analytical aspects of human drug development.
Practical: GC-MS (demonstration)

14th week:
Lecture: Environmental rules, prescriptions and applied analytical methods and techniques in the pharmaceutical industry.
Practical: Consultation.

15th week:
Lecture: 2nd control test.
Self Control Test

Requirements

At least 30 % of the lectures must be visited. Students have to write two control test, on 7th, and 15th week. If the results of the tests will not be at least 60%, the students will not be able to take oral exam.
Obsense of more than one practice is not allowed during the semester. The missed practice can be made up exclusively on the 14th week of the semester. Only students having adequately fulfilled the requirements of practice are allowed to get the signature and to take the final oral exam.

Subject: **PHARMACOLOGY PRACTICE II.**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction to Pharmacology II.

2nd week:
Practical: Experimental demonstration I.

3rd week:
Practical: Experimental demonstration II.

4th week:
Practical: Experimental demonstration III.

5th week:
Practical: Experimental demonstration IV.

6th week:
Practical: Antihypertensive agents

7th week:
Practical: Hypothalamic and pituitary hormones. Diabetes mellitus and antidiabetic drugs. General characteristics of steroid hormones. Adrenocorticosteroids and adrenocortical antagonists.

8th week:
Practical: The gonadal hormones and inhibitors. Uterotonics, tocolytics. Agents that affect bone mineral homeostasis. Thyroid and antithyroid drugs.

9th week:
Practical: Drugs used in acid-peptic disease. Gastro-oesophagal reflux disease (GERD). Drugs promoting gastrointestinal motility. Antiemetic drugs. Laxatives. Antidiarrheal drugs.

10th week:
Practical: Drugs used in the treatment of chronic inflammatory bowel disease. Pancreatic enzyme replacement products. Pharmacology of the liver. Regulation of the appetite. Pharmacotherapy of obesity. Gerontopharmacology.

11th week:
Practical: Histamine and antihistaminic drugs. Serotonin, agonists and antagonists.

12th week:
Practical: Antifungal agents. Antiparasitic chemotherapy: basic principles. Antiprotozoal drugs. Anthelmintic drugs.

13th week:
Practical: Immunpharmacology

14th week:
Practical: Cancer chemotherapy

15th week:
Practical: General consultation on the curriculum of the second semester

Requirements

During the semester students have to take two exams. Requirements for the signature of the Lecture Book for the semester are at least a pass (2) on both exams. Attendance at seminars is compulsory: the signature may be refused in the case of absences from more than four seminars. Signature is compulsory for the student to be allowed to take the Final Exam (FE).
The average of the two mid-semester exams provides the grade of the Assessment of Workmanship (AW5) for the Pharmacology II. practice. In case the student does not reach a pass (2) on both mid-semester exams, the signature of the lecture book is refused, and the student fails the semester. In case the student does not reach a pass (2) on one of the mid-semester exams, the student must take a correction exam from all the topics of the semester on the last week of the semester. The grade of the correction exam will be averaged with the two mid-semester exams and this average will give the grade of the Assessment of Workmanship (AW5) for the Pharmacology II. practice. Further correction of this AW5 grade is not an option.

Subject: **PHARMACOLOGY THEORY II.**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: Myocardial ischemia, antianginal drugs. Drugs used in heart failure.

2nd week:
Lecture: Agents used in cardiac arrhythmias

3rd week:
Lecture: Antihypertensive agents Agents used in hyperlipidemia

4th week:
Lecture: Bronchodilators and other agents used in asthma.

5th week:
Lecture: Diuretics and antidiuretics Drugs used in disorders of coagulation.

6th week:
Lecture: Introduction to the pharmacology of the endocrinology. Hypothalamic and pituitary hormones.

7th week:
Lecture: Diabetes mellitus and antidiabetic drugs. General characteristics of steroid hormones. Adrenocorticosteroids and adrenocortical antagonists.

8th week:
Lecture: The gonadal hormones and inhibitors. Uterotonics, tocolytics. Agents that affect bone mineral homeostasis. Thyroid and antithyroid drugs.

9th week:
Lecture: Introduction to the pharmacology of gastroenterology. Drugs used in acid-peptic disease. Gastro-oesophagal reflux disease (GERD). Drugs promoting gastrointestinal motility. Antiemetic drugs. Laxatives. Antidiarrheal drugs.

10th week:
Lecture: Drugs used in the treatment of chronic inflammatory bowel disease. Pancreatic enzyme replacement products. Pharmacology of the liver.Regulation of the appetite. Pharmacotherapy of obesity. Gerontopharmacology.

11th week:
Lecture: Pharmacology of the inflammation, steroid and non-steroid anti-inflammatory drugs, the ergot alkaloids. Pharmacotherapy of rheumatoid arthritis.

12th week:
Lecture: Beta-lactam antibiotics. Chloramphenicol, tetracyclines, aminoglycosides. Macrolides. Quinolones. Antiviral chemotherapy and prophylaxis.

13th week:
Lecture: Immunpharmacology

14th week:
Lecture: Cancer chemotherapy

15th week:
Lecture: Toxicology

Requirements

During the semester students have to take two exams. Requirements for the signature of the Lecture Book for the semester are at least a pass (2) on both exams. Attendance at seminars is compulsory: the signature may be refused in the case of absences from more than four seminars. Signature is compulsory for the student to be allowed to take the Final Exam (FE).
At the end of the semester from Pharmacology II. theory students take Final Exam (FE) which is oral. Students draw 2 exam titles from the topics of the second semester and 1 exam title from the topics of the first semester.

Institute of Behavioural Sciences, Faculty of Public Health

Subject: **BIOETHICS**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: The concept of bioethics. The distinction between traditional medical ethics and modern bioethics: (1) wider scope and (2) new (society- and patient-oriented) attitude. The emergence of bioethics and the major (social, historical, scientific and philosophical) factors playing central roles in it. Bioethics and pharmacology.

2nd week:
Lecture: The four basic principles of bioethics: (1) nonmaleficence; (2) beneficience; (3) autonomy; (4) justice. The importance of antipaternalism. The role of classic or modern medical oaths in bioethics. International declarations regarding medical and pharmacological ethics.

3rd week:
Lecture: Patients' rights. The importance of the patients-oriented approach. The Hungarian legal regulations of patients' rights in the light of an international comparison.

4th week:
Lecture: The principle of informed consent. The different aspects of providing appropriate information to patients. Theory and practice of risk communication. The bioethics of the so-called Evidence-Based-Medicine.

5th week:
Lecture: The ethics of scientific research and publications. The very basics of philosophy of science. The ethical problems raised by the recent tendency of commercialization of scientific, medical and pharmaceutical research. The ethical problems of scientific openness. Public vs. private scientific research. The ethics of scientific research and publication in the special area of pharmaceutical research. The

ethical relevance of the so-called conflict of interests (a central problem of current bioethics).

6th week:
Lecture: Ethical questions of advertisement of medical tools (drugs etc.). Drugs in the market. The special ethical questions regarding direct-to-consumer (DST) advertisements.

7th week:
Lecture: The ethics of current biotechnology. Various ethical questions raised by recent and future advances of genetics, robotics, nanotechnology, pharmacology and brain-sciences.

8th week:
Lecture: The ethical aspects of medical experiments on human beings. The principle of informed consent. The history of experimentations on humans. The Nurenberg Code (1947). The Helsinki Declaration (1964). The ethics of double-blind experimental set-ups. The importance of the placebo-effect.

9th week:
Lecture: The ethical aspects of medical experiments of non-human animals. The possiblitity of extrapolations of the results of animal experiments to human anatomical, physiological and mental phenomena in the lights of current evolutionary theory. The essential ethical questions concerning the ethical acceptibility of animal experimentations in medical and pharmaceutical research. The history of animal well-being, animal liberation and animal rights (as well as environmental ethics) movements.

10th week:
Lecture: Psychiatric ethics/neuroethics. The different approaches to diseases. (What is a disease? What is normal?) How can we make a difference between medically normal and abnormal people? Introduction to philosophy of medicine.

11th week:
Lecture: The distinction between therapy and enhancement: one of the central topics of current bioethics (with a special emphasis on pharmacological ethics).

12th week:
Lecture: Ethical questions of current reproductive technologies. The ethics of abortion and infanticide. Where human life begins?

13th week:
Lecture: End-of-life decisions in current bioethics. Ethical questions concerning death, living will, transplantations, euthanasia, physician-assisted suicide and hospices. The right to die debate. Current neuroscience and bioethics.

14th week:
Lecture: The justice-principle. Questions about local and global justice in medicine (with special attention to pharmacological aspects). What does just allocation of constrained resources mean? Should we provide poor countries with expensive life-saving drugs? The effects of globalization on bioethics/pharmacological ethics.

15th week:
Lecture: Written exam.

Requirements

Attendance in the lectures is required. Usable understanding of the core theoretical concepts and conceptions is required as well as the knowledge on the actual patients' rights regulation.

CHAPTER 20
ACADEMIC PROGRAM FOR THE 5TH YEAR

Department of Biopharmacy

Subject: **BIOPHARMACY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**
Practical: **30**

1st week:
Lecture: Fundamentals to biopharmacy.
Practical: Basic pharmacokinetic parameters.

2nd week:
Lecture: The LADMER system and its components.
Practical: Volume of Distribution, Clearance, Half-life.

3rd week:
Lecture: Liberation, absorption, distribution, metabolism, elimination, response.
Practical: One-compartment open model.

4th week:
Lecture: Drug release from the delivery system, bioavailability of the drug at the absorption site.
Practical: Continuous and intermittent drug delivery.

5th week:
Lecture: Drug clearance, hepatic drug elimination, renal drug elimination.
Practical: Equations, pharmacokinetic calculations.

6th week:
Lecture: Drug transport. Active and passive transport.
Practical: Equations, pharmacokinetic calculations II.

7th week:
Lecture: Type of drug delivery systems.
Practical: Equations, pharmacokinetic calculations III.

8th week:
Lecture: Biopharmacy of tables and capsules.
Practical: Equations, pharmacokinetic calculations IV.

9th week:
Lecture: Oral controlled release.
Practical: Equations, pharmacokinetic calculations V.

10th week:
Lecture: Delivering drugs by inhalation.
Practical: Equations, pharmacokinetic calculations VI.

11th week:
Lecture: Transdermal system.
Practical: Equations, pharmacokinetic calculations VII.

12th week:
Lecture: Time-programmed and patient-controlled drug delivey.
Practical: Equations, pharmacokinetic calculations VIII.

13th week:
Lecture: Smart drug delivery system and targeted therapy.
Practical: Equations, pharmacokinetic calculations IX.

14th week:
Lecture: Pharmaceutical biotechnology.
Practical: End of semester control test

Requirements

At least 30 % of the lectures must be visited. Students have to write end of semester control test. If the result of the test will not be at least 60%, the students will not be able to take oral exam. Obsense of more than one practice is not allowed during the semester. The missed practice can be made up exclusively on the 14th week of the semester. Only students having adequately fulfilled the requirements of practice are allowed to get the signature and to take the final oral exam.

Subject: **PHARMACEUTICAL CARE**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Pharmaceutical care (history, subject, theory, basic)

2nd week:
Lecture: Medication therapy management (subject, concept, theory)

3rd week:
Lecture: International pharmaceutical care protocols

4th week:
Lecture: Pharmaceutical care in Metabolic Syndrome

5th week:
Lecture: Diabetes prevention and pharm. care

6th week:
Lecture: Dyslipidemia and hypertension

7th week:
Lecture: Practice and theory of cholesterol, glucose, INR, and blood pressure measurement I.

8th week:
Lecture: Practice and theory of cholesterol, glucose, INR, and blood pressure measurement II.

9th week:
Lecture: Nutrition, diet and pharm. care I (theory, BMI, calculations, prevention, nutrition piramid)

10th week:
Lecture: Nutrition, diet and pharm. care II (special diet and nutrition, special diet in metabolic syndrome and in oncology patients)

11th week:
Lecture: Pharmaceutical care and it’s limitation (in cold, cough, flu, upper respiratory problems, fever, sunburn etc.)

12th week:
Lecture: Asthma, COPD and special inhalation medication.

13th week:
Lecture: Pharmaceutical care in reflux problems, heart burn, etc.

14th week:
Lecture: Pharm. care in hemostasis (coagulation, measurement etc.)

15th week:
Lecture: Consultation

Requirements

At least 30 % of the lectures must be visited. The missed lectures can be made up exclusively on the 14th week of the semester. Only students having adequately fulfilled the requirements are allowed to get the signature and to take the final exam.

Department of Clinical Pharmacology

Subject: **CLINICAL PHARMACOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Basic principles of Clinical Pharmacology.

2nd week:
Lecture: Ethical and legal aspects.

3rd week:
Lecture: The study phases (I-II).

4th week:
Lecture: The study phases (III-IV).

5th week:
Lecture: The clinical trial protocol.

6th week:
Lecture: The GCP requirements in Clinical Pharmacology.

7th week:
Lecture: Study Report (Clinical, Final).

8th week:
Lecture: Statistical methods in Clinical Pharmacology.

9th week:
Lecture: Quality Assurance in Clinical Pharmacology.

10th week:
Lecture: Adverse events, serious adverse events, side effect.

11th week:
Lecture: Patient Information and Informed Consent.

12th week:
Lecture: Practical experience in an ongoing study.

13th week:
Lecture: Visit of a pharmaceutical company.

Requirements

The aim of this course is to introduce the students into a rapidly developing and evolving subject. Clinical Pharmacology is not merely a link between Pharmacology and Clinical Medicine. The objective is to enhance the understanding of how drugs act and may be best used in the clinic, how compounds are transformed into drugs, how clinical trials are conducted.

Requirements of admission: after 4 years of pharmaceutical or medical studies

Speakers:
Miklós Bodor, M.D.,Ph.D., Associate Professor, Head of the Division of Clinical Pharmacology
Péter Kovács, M.D.,Ph.D.,Dsc, Professor in Pharmacology
Sándor Somodi, M.D.,Ph.D., Assistant Professor

Required infrastructure: lecture hall, library

Examination: oral and written

Literature: special papers and handbooks will be provided

Department of Environmental Physics of University of Debrecen and ATOMKI

Subject: **RADIOPHARMACY PRACTICE**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Practical: **18**

Requirements

Practice: (i) main rules of radiation protection, (ii) activity calculation, (iii) gamma-spectrometry, (iv) iodine capsules and technetium generators, (v) visit in the PET centres, (vi) radio-HPLC methods.

Subject: **RADIOPHARMACY THEORY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: Radionuclides and radioactive tracking in the living organs - nuclear medicine.

2nd week:
Lecture: Radiation properties of radionuclides for diagnosis and therapy. Dosimetry.

3rd week:
Lecture: In vivo radioisotope diagnostics in humans.

4th week:
Lecture: Radionuclide therapy as human treatment.

5th week:
Lecture: General methods of radioisotope manufacturing.

6th week:
Lecture: Radionuclide genarators and applications.

7th week:
Lecture: Preparation of radiopharmaceuticals used in nuclear medicine, quality assurence, GMP

8th week:
Lecture: Advantage and disadvantages of radiopharmaceutical kit formulation. The

Nuclear Pharmacy concept.

9th week:
Lecture: Preparation and use of radiopharmaceuticals with positron emitters (F-18, C-11, N-13, O-15).

10th week:
Lecture: Radioactive noble gases (Kr-81m, Xe-133) and I-123 as well as I-131 labelled radiopharmaceuticals.

11th week:
Lecture: Anionic Tc-99m complexes for renal, bone and hepatobiliar investigations.

12th week:
Lecture: Neutral and cationic Tc-99m complexes; brain and heart imaging.

13th week:
Lecture: Preparation and use of Tc-99m labelled macromolecules and radiocolloids; blood cell labelling.

14th week:
Lecture: Other radioactive metals in diagnostic radiopharmaceuticals (Cr-51, Ga-67, In-111, T1-201).

15th week:
Lecture: Therapeutic radiopharmaceuticals containing P-32, Y-90, I-131, Sm-153, Re-186 and Re-188 radionuclides.

Requirements

Radioactive tracing under in vivo conditions. Principles of diagnostic imaging and radionuclide therapy. Types of physiological and biochemical processes to be traced with radioactive methods: macroscopic flow systems (blood, liquor and lymphatic circulation), selective localization (absorption), metabolism and excretion.
Radioactive tracers: types of radiations, radioisotope preparations, decay rows, generator systems, GMP productions. The Mo-99/Tc-99m generator and other generators.
Tc-99m radiopharmaceuticals: cationic, neutral and anionic complexes as well as colloids. Technetium labelling techniques. Ga-67/68, In-111 and Tl-201 radiopharamceuticals. PET radiopharmaceuticals: C-11, N-13, O-15, F-18 compounds. Radiopharmaceuticals containing radioiodine (I-123, I-131). Therapeutic radiopharmaceuticals.

(See also reading material, Gopal B. Saha: Fundamentals of Nuclear Pharmacy, Springer 2010, sixth edition)

Department of Pharmaceutical Chemistry

Subject: **QUALITY CONTROL**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Definition and history of quality management. Basics of quality policy. Definitions of Quality Assurance (QA) and Quality Control (QC).

2nd week:
Lecture: Elements of Total Quality Management (TQM). Key issues of establishing TQM. The Six Sigma concept. Construction of a Project Quality Plan.

3rd week:
Lecture: Quality in the manufacturing and marketing activity. The quality circle. Quality improvement tools and techniques. Quality systems: the history of development and basics of the ISO system of standards.

4th week:
Lecture: Relationship between the elements of quality management, QA, GMP and QC. The GXP system for drug production and distribution. Good Pharmacy Practice (GPP). Philosophy, elements and directives of GPP. Guidelines for GPP requirements in practice.

5th week:
Lecture: The role of the GXP system during the life cycle of medicines and drug-can-didates. The concept of Good Manufacturing Practice (GMP) requirements. Application of GMP: quality management.

6th week:
Lecture: Application of GMP: personnel aspects; premises and equipment.

7th week:
Lecture: Application of GMP: documentation.

8th week:
Lecture: Application of GMP: production, manufacturing.

9th week:
Lecture: Application of GMP: contract manufacture and analysis; complaints and recalls; self-inspection. Validation: basic concepts of Good Validation Practice (GVP).

10th week:
Lecture: Basics of Good Distribution Practice (GDP). Personnel aspects of quality management infrastructue: responsibilities of the key personnel (production leaders and quality managers). The phenomenon of Qualified Person (QP).

11th week:
Lecture: The cost of quality: failure costs, prevention costs, appraisal costs. Sterile drug production: GMP requirements, methods of sterilization.

12th week:
Lecture: Definition and elements of Good Laboratory Practice (GLP). Documentation of the laboratory examinations and experiences. Good Control Laboratory Practice (GCLP). Essentials of Good Clinical Practice (GCP). Quality assurance of GCP. ICH GCP guidelines.

13th week:
Lecture: Inspections and auditing. International harmonization of inspections (PIC/S; ICH). WHO Guidelines for inspections.

14th week:
Lecture: The Drug Registration procedure. Approval by the EU Member State authorities (EMEA). The US Federal Food and Drug Administration (FDA): Office of Regulatory Affairs (ORA). FDA Center for Drug Evaluation and Research (CDER). FDA quality system regulations for drug approval.

15th week:
Lecture: Corruption and pharmaceuticals. Counterfeiting medicines. Hazard Analysis Critical Control Point (HACCP). Discussion of the topics of the lectures and questions emerging during the Semester. An occasional, on-demand written self-control test.

Requirements

Within the pharmaceutical industry, quality is the key issue that has to be addressed above all others. It is the reason that so many regulations, guidelines and controls are important and applied. The course "Quality assurance" deals with quality in its widest sense, reviewing the International

Standards Organization (ISO) series of standards, generic instruments such as Total Quality Management (TQM) and industry-specific topics like Good Manufacturing Practice (GMP). The conduct of pre-clinical and clinical studies of drug-candidates is controlled by a variety of regulations and guidelines known collectively as Good Laboratory Practice (GLP) and Good Clinical Practice (GCP), respectively. The assurance of safety and efficacy of pharmaceuticals from the time they leave the factory to the point at which they are used by the patient is the concept of Good Distribution Practice (GDP) and Good Pharmacy Practice (GPP), which latter is also essentially obliged to take care of patients under physician-controlled- and self-medication.

Department of Pharmaceutical Technology

Subject: **CLINICAL PHARMACY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**
Practical: **30**

1st week:
Lecture: Introduction, definitions. Basic principles. What is Clinical Pharmacy?
Seminar: Introduction, general information.

2nd week:
Lecture: Drug order, dispensing and control. Arts of order. Failure during drug ordering. Drug safety (unit dose system, role of clinical pharmacist). Drug dispensing system. Drug information.
Seminar: Adverse drug events, side effects I.

3rd week:
Lecture: The role of clinical pharmacist in a patient treatment.
Seminar: Adverse drug events, side effects II.

4th week:
Lecture: Therapeutic drug monitoring.
Seminar: Adverse drug events, side effects III.

5th week:
Lecture: Infusion systems. Basic principles. Formulation of infusions. Investigation of infusions. Special infusion systems. Incompatibility and instability. Iv additives and its compatibility. Plastic bags. Cytotoxic drugs.
Seminar: Adverse drug events, side effects IV.

6th week:
Lecture: Clinical nutrition. Enteric and parenteric nutrition. Total parenteric nutrition. Parenteric nutritive infusions, fat emulsions. "All in one" mixtures.
Seminar: Adverse drug events, side effects V.

7th week:
Lecture: Compliance, non-compliance. Pharmaceutical Care.
Seminar: Pharmaceutical care I.

8th week:
Lecture: GCP
Seminar: Pharmaceutical care II.

9th week:
Lecture: Evidence based medicine.
Seminar: Pharmaceutical care III.

10th week:
Lecture: Pharmacovigilance
Seminar: Pharmaceutical care IV.

11th week:
Lecture: Wound management
Seminar: Pharmaceutical care V.

12th week:
Lecture: Quality assurance in Health Care System

Seminar: On ward visiting I.

13th week:
Lecture: Infection control, prevention and surveillance
Seminar: On ward visiting II.

14th week:
Lecture: Pharmacoeconomy. Ethics. Cost-benefit, risk-benefit.
Seminar: On ward visiting III.

15th week:
Lecture: Consultation
Seminar: Consultation.

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam. Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn't attend 30% of lectures.

Subject: **DRUG INTERACTIONS THEORY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Introduction, definitions. Basic principles. Pharmacokinetic and pharmacodynamic interactions.

2nd week:
Lecture: Biotransformation, pharmacogenetics. Vaccination related interactions.

3rd week:
Lecture: Antithrombotic therapy and its interactions.

4th week:
Lecture: Cancer management and drug interactions.

5th week:
Lecture: Diabetes treatment and it's drug interactions. Contraceptives' interactions.

6th week:
Lecture: Possible interactions during antibiotic therapy.

7th week:
Lecture: The role of alcohol in interactions. CNS drugs and interactions 1.

8th week:
Lecture: CNS drugs and interactions II.

9th week:
Lecture: NSAIDs- drug interactions.

10th week:
Lecture: Interactions with sympathomimetics and antiasthmatics.

11th week:
Lecture: Cardiovascular drug interactions I.

12th week:
Lecture: Cardiovascular drug interactions II.

13th week:
Lecture: Consultation.

14th week:
Lecture: Consultation.

15th week:
Lecture: Consultation.

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam. Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn't attend 30% of lectures.

Subject: **PHARMACEUTICAL COMMUNICATION SKILLS**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **15**
Seminar: **5**

1st week:
Practical: Verbal communication

2nd week:
Practical: Verbal communication

3rd week:
Practical: Non-verbal communication

4th week:
Practical: Non-verbal communication

5th week:
Practical: Metacommunication

6th week:
Practical: Metacommunication

7th week:
Practical: Problem solving lectures based on different special situations

8th week:
Practical: Problem solving lectures based on different special situations

9th week:
Practical: Problem solving lectures based on different special situations

10th week:
Practical: Problem solving lectures based on different special situations

11th week:
Practical: Problem solving lectures based on different special situations

12th week:
Practical: Problem solving lectures based on different special situations

13th week:
Practical: Problem solving lectures based on different special situations

14th week:
Practical: Problem solving lectures based on different special situations

15th week:
Practical: Test writing
Self Control Test

Requirements

Attendance in the lectures is required.

Institute of Behavioural Sciences, Faculty of Public Health

Subject: **PHARMACEUTICAL PSYCHOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture:

2nd week:
Lecture:

3rd week:
Lecture:
Basics of communication. Communication with handicapped people

4th week:
Lecture: Communication with elderly people

5th week:
Lecture: Stress, coping, psychological immune system

6th week:
Lecture: Biopsychosocial model. Health behaviors: definition, demographic determinants. The model of health beliefs, variables influencing health attitudes.

7th week:
Lecture: Illness behaviors: definition, the experience of illness, patient role. Representations and benefits of illness. Illness cognitions

8th week:
Lecture: Illness as crisis. Chronic illness, hospitalisation.

9th week:
Lecture: The placebo effect

10th week:
Lecture: The psychology of pain.

11th week:
Lecture: Change in health behavior. Stages of change, the Prochaska-DiClemente model.

12th week:
Lecture: Body image disorders and eating disorders.

13th week:
Lecture: Addictions: classification; alcohol dependence in society and in families.Smoking. Behavioral addictions.

14th week:
Lecture: Mood disorders and psychotic disorders. Symptoms, prevalence relevance and compliance

15th week:
Lecture: Exam.

Requirements

Attendance in the lectures is required. Usable understanding of the core theoretical concepts and conceptions is required as well as the knowledge on the actual patients' rights regulation.

CHAPTER 21
REQUIRED ELECTIVE COURSES

Department of Applied Chemistry

Subject: **PHARMACEUTICAL EXCIPIENTS**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **15**

1st week:
Seminar: Basic standards of SI. Prefixes. Measurements in pharmacy.

2nd week:
Seminar: Basic chemical calculations.

3rd week:
Seminar: Introduction to Polymer Chemistry.

4th week:
Seminar: Polymeric excipients, general characterization..

5th week:
Seminar: General view of a medicine. Active ingredients, excipients, contaminants.

6th week:
Seminar: Consultation, problem solving

7th week:
Seminar: mid term test

8th week:
Seminar: Controlled drug release.

9th week:
Seminar: Fillers, solvents, emulsifiers.

10th week:
Seminar: Antioxidants, preservatives.

11th week:
Seminar: Aerosol propellants, colorants.

12th week:
Seminar: Materials for packaging.

13th week:
Seminar: Incompatibility.

14th week:
Seminar: Consultation, problem solving.

15th week:
Seminar: end-term test

Requirements

The presence of students at the seminar is obligatory and will be recorded. If the student is absent from more than 4 seminars, the semester will not be accepted Evaluation is based on exam performance: mid-course and end-course written exams (50-50 %). Detailed information will be given in the first lecture.

Department of Biochemistry and Molecular Biology

Subject: **MOLECULAR MECHANISM OF DISEASES CONCERNING GREAT POPULATIONS**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **25**

1st week:
Lecture: Introduction to molecular medicine

2nd week:
Lecture: Genomic medicine

3rd week:
Lecture: Diabetes

4th week:
Lecture: Obesity

5th week:
Lecture: Vitamin D and immundefects

6th week:
Lecture: Cancer I.

7th week:
Lecture: Cancer II.

8th week:
Lecture: Cancer II.

9th week:
Lecture: Osteoporosis

10th week:
Lecture: Immunedeficiencies

Requirements

Attendance on the lectures is compulsory.

Department of Biophysics and Cell Biology

Subject: **COMPUTER SCIENCE**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Exemption Tests.

2nd week:
Practical: Word processor programs, MS Word I. 1. File: save, save as, print, new document, open 2. Editing text 1: input letters, cursor, copy, paste, paste special, cut, move, clipboard, undo, redo 3. Editing text 2: selecting text, mouse, keyboard, shift, control, home, end, pgup, pgdown 4. Home 1: formatting font, font size, font color, typeface, bold, italic, underline, highlighting, super/subscript, customize menu 5. Home 2: formatting paragraph, line spacing, indentation (left, right, first line, hanging), alignment (Tabs: left, center) 6. Home 3: bulleted, numbered list, searching text, find, replace, select all 7. Insert: tables, inserting pictures, shapes, page numbers, header, footer, page break, symbols, (text box) 8. Page layout: margins, orientation, size, manual setting of margins , columns, line numbers, watermark, page color, page borders
9. References: table of contents
10. Review: Word count, Track changes
Extra Exemption test appointments ONLY for students with late registration!

3rd week:
Practical: Word processor programs, MS Word II.

4th week:
Practical: Word processor programs, MS Word III.

5th week:
Practical: Spreadsheets programs, MS Excel I. 1. Entering data (difference b/w text & numbers), autofill series (numbers, days, months, etc.), adjusting column width 2. Editing: copy, paste, move, inserting/deleting lines/rows, selecting non-adjacent rows/columns (Ctrl) 3. Entering formulas (=), symbols for mathematical operations (+-*/^EXP()), copying cells with formulas, relative/absolute reference 4. Using functions, statistical functions: average, stdev, count, sqrt, countif, if, calculating SEM, etc. 5. Creating charts: bar chart, scatter plot, error bars, labels 6. Formatting charts: colors, symbols, axis scaling, chart title, axis title 7. Data sorting by one or more criteria, filters 8. (Statistical tests (F-test (equal variance test), t-test assuming equal/unequal variances))

6th week:
Practical: Spreadsheets programs, MS Excel II.

7th week:
Practical: Spreadsheets programs, MS Excel III.

8th week:
Practical: Spreadsheets programs, MS Excel IV.
9th week:
Practical: Computerised presentation, MS PowerPoint. 1. Entering text, inserting figures / drawing objects 2. Editing: selecting multiple objects, resizing, rotating, copy, paste, move, undo, redo 3. Colors: background (templates), line, fill 4. Alignment, grouping, order (front/back), arranging objects (distribute horiz. / vert.) 5. Slide sorter, slide show 6. Slide transitions, animations

10th week:
Practical: Fundamentals and basic concepts of informatics.

11th week:
Practical: Logical and physical realization of networks.

12th week:
Practical: Internet.

13th week:
Practical: Summary.

14th week:
Practical: Test I.

15th week:
Practical: Test II.

Requirements

The acquisition of fundamental theoretical and practical knowledge from the function of the modern personal computers. Course description: PC architecture, operating systems, file management, network knowledge, internet and its opportunities of application, word processor, spreadsheet, the usage of presentational programs, the achievement of scientific databases and its use. Without registration, there is no way to do the course! First year students who missed/skipped the exemption test, but signed up for the course in the Neptun must attend the course and do the final test at the end. For students attending the informatics course a maximum of 4 absences are allowed during the semester to receive a signature (we recommend to use as few as possible, in case an emergency comes up). This is taken very seriously! Missing more than 4 classes automatically means losing the chance to pass the course. There will be a final test at the end of the semester. For students attending the informatics course a maximum of 4 absences are allowed during the semester (we recommend to use as few as possible, in case an emergency comes up). This is taken very seriously! Missing more than 4 classes automatically means refused signature therefore losing the chance to pass the course. Every student allowed to make up the missed practicals with another group but only on the given week, if there are enough free seats in the room. For students attending the informatics course a maximum of 4 absences are allowed during the semester to receive a signature (we recommend to use as few as possible, in case an emergency comes up). This is taken very seriously! Missing more than 4 classes automatically means losing the chance to pass the course. There will be a final test at the end of the semester. Every student is allowed to make up the missed practicals with another group but only on the given week, if there are enough free seats in the room. The course start with an exemption test. Only first year students allowed to write the exemption test at the first week of the given semester with their group (appointment should be checked in the given timetable). In any other cases (students older than first year/repeaters/students who are not exempted) has a final test at week 14 of the given semester. There is no other self control test during the semester. At the end of the course students will write a final test. The exemption and the final tests covers topics and skills in connection with Microsoft office Word, Excel, and PowerPoint (versions:2007/2010) programs, as written in the curriculum. Both of the tests (exemption and the final test) are written tests. The tests are practical tests, conducted in the computer room. Students passing the exemption test will automatically receive 5 (excellent) grade at the end of the semester. Final grades based on the final test score will be given according to the following table:

61% = garde 1 (fail)
61%-70% = grade 2 (pass)
71% - 80% = grade 3 (satisfactory)
81% - 90% = grade 4 (good)
91% = garde 5 (excellent)

Students should download free Office guide books from the following link. (Email registration is required for downloading files). Students who did not get exemption/did not show up at the exemption test/repeaters/students older than first year MUST ATTEND on the course. They should join to one of the groups mentioned in the timetable. The number of the seats is limited in the classroom. Students who has informatics course in the given appointment (according to the timetable) have priority to attend the lesson. Others are allowed to join to the given group if there are more free seats. Older students have to do the whole course as well. Students passing the exemption test will automatically receive 5 (excellent) grade at the end of the semester. Students who failed the exemption test must attend the course and do the final test at the end. Students having ECDL (European Computer Driving Licence) are not required to write the exemption test, instead, they can submit exemption request to the Education Office. Until You are waiting for the decisions, You should also come to the course!!!

Subject: **MODERN BIOPHYSICAL METHODS IN BIOLOGY AND MEDICINE**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **24**

3rd week:
Lecture: Medical applications of NMR and MRI.

4th week:
Lecture: Luminescence spectroscopy. Theoretical background and principles of application of fluorescence spectroscopy to study the structure of proteins, nucleic acids and that of

the cell membrane. Fluorescence conjugation of biomolecules, techniques based on fluorescence polarization and fluorescence resonance energy transfer.

5th week:
Lecture: Modern microscopy methods for structural and functional characterization of cells. Theoretical background of fluorescence microscopy and image processing. Generation of scanning and wide-field images. Detectors, analog/digital conversion and digital storage of images. Digital image analysis: principles and biological applications. Principles of confocal microscopy. High resolution non-linear optical microscopy.

6th week:
Lecture: Principles and applications of flow cytometry. Structure of a flow cytometer and its application fields: immunogenetics, receptor and antigen research and diagnostics, DNA and cell cycle analysis, measurement of membrane potential, membrane permeability and determination of cytosolic pH and ion concentrations, application of fluorescence resonance energy transfer to determine protein associations. (FCET).

7th week:
Lecture: Structure of the cell membrane, functional consequences of the mobility (lateral and rotational movement) of proteins in the membrane. Novel models for the structure of the cell membrane, lipid domains. Time-dependent fluorescence and phosphorescence spectroscopy, fluorescence recovery after photobleaching (FRAP), fluorescence correlation spectroscopy.

8th week:
Lecture: Modern electrophysiological techniques. Passive and active electrical properties of the cell membrane, structure and function of ion channels. Principles and application of the patch clamp technique: recording ionic currents and membrane potential.

9th week:
Lecture: LSC - Laser-Scanning Cytometry (imaging cytometry, slide-based imaging cytometry). Limitations of flow cytometry and microscopy. Comparing flow cytometry, confocal microscopy and laser-scanning cytometry. How does laser-scanning cytometry work? Strength and limitations of the laser-scanning cytometry. Laser scanning-cytometry in cell biology and clinical research.

10th week:
Lecture: Closing test

Requirements

Aim of the course: Based on the principles covered in biophysics and cell biology discussion of problems with special relevance to medical biology from a moderm molecular biophysical and quantitative biological aspect.

Short description of the course topics:
1. Application of nuclear magnetic resonance spectroscopy (NMR) and imaging (MRI) in biology and medicine
2. Luminescence spectroscopy.
3. Flow cytometry and its applications.
4. Structure of the cell membrane, mobility of lipids and proteins in the plasma membrane.
5. Advanced microscopy.
6. Modern electrophysiological techniques
7. Slide-based cytometry.

Compulsory literature: course material and lecture slides published on the website of the Department

Recommended reading: Medical biophysics (Damjanovich, Fidy, Szöllősi Eds.), Medicina, 2009;

Web address for the course material:

Type of examination: practical grade, 5 levels

Requirements:

Conditions for signing the lecture book: attending 5 lectures out of 7. Attention! Lecture books are handled exclusively by the study advisor during the dedicated office hours!

Type of examination: practical grade, 5 levels

Examination: Written test. The exam date is shown in the.

below 50%:	fail
50%-59%:	pass
60-69 % :	satisfactory
70-79 %:	good
>= 80%	excellent

Repeated/improved exam: during the examination period, one occasion, written test.

Department of Inorganic and Analytical Chemistry

Subject: **ENVIRONMENTAL ANALYTICAL CHEMISTRY**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **45**

Department of Pharmaceutical Chemistry

Subject: **CHEMICAL BIOLOGY**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: Structure of proteins and polysaccharides.

2nd week:
Lecture: Structure of nucleic acids

3rd week:
Lecture: Structure of macromolecular lipides. Interactions determinating the structure of macrolecules.

4th week:
Lecture: Chemical synthesis of peptides and proteines.

5th week:
Lecture: Chemical synthesis of polysaccharides.

6th week:
Lecture: Chemical synthesis of nucleic acids

7th week:
Lecture: Molecular biology as a tool of chemical biology.

8th week:
Lecture: Methodologies of molecular biology

9th week:
Lecture: Electron spectroscopy and vibrational spectroscopy in chemical biology

10th week:
Lecture: Basics of NMR spectroscopy

11th week:
Lecture: X-ray diffraction. Theoretical calculations in chemical biology.
12th week:
Lecture: The molecular recognition.

13th week:
Lecture: Mass spectrometry in chemical biology.

14th week:
Lecture: Case studies of chemical biology.

15th week:
Lecture: Case studies of chemical biology.

Requirements

The aim of the course: to treat the fundamentals of modern analytical and synthetic methodologies that can be applied in biological research.

Requirements: Good knowledge of basic organic chemistry.
Teaching material will be provided at the beginning of the course.

Subject: **ILLICIT DRUGS**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **15**

Department of Pharmaceutical Surveillance and Economics

Subject: **INTRODUCTION TO FINANCIAL MANAGEMENT FOR PHARMACISTS**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **12**
Practical: **5**

1st week:
Lecture: Models and the key elements of micro-economy, specific aspects of a market on price related to product characteristics and demand.

2nd week:
Lecture: Consumer decisions. Management of an investment: costs and margins. Calculations of ROI and IRR.

3rd week:
Lecture: Model for macroeconomy. National and international relations of goods, price and investments.

4th week:
Lecture: The trends on inflation and unemployment rate. Decisions of fiscal and monetary politics.

5th week:
Lecture: Business aspects of a Pharmacy operation. Management in a pharmacy. The concepts and the most important cost categories and definitions, P/L and the balance sheet.

6th week:
Lecture: The operation, financial aspects of a pharmacy as a business unit. Revenue, costs and cash/ flow.

7th week:
Seminar: Elements of a Business plan and C/F plans.

8th week:
Seminar: Calculations of an investment, plan for business development, expected revenue and return of investment in a Business plan and C/F in practice.

Requirements

Concerning attendance of classes, the rules in the Regulations Governing Admission, Education and Examinations of the University of Debrecen are valid.
Participation in at least three (3) of 6 interim tests are required for the signature. Those ones who failed will be required to pass the "semifinal test" in order to obtain signatures.

Exam (semifinal, kollokvium)
The exam will be written and oral exam at the end of the semester which covers all the topics of the semester. Written part: Test and three topics from selected list of questions provided.
Grade (semifinal mark) The average of the three scores (Test, Topics) compose the final mark (1-5 grades).

Subject: **INTRODUCTION TO PHARMACOECONOMY AND - EPIDEMIOLOGY**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **10**
Seminar: **2**

1st week:
Lecture: Introduction to Pharmacoepidemiology: The new concept and definitions, Study design, methodology; Kay parameters in epidemiology; Sample size, bias, confounding analysis.

2nd week:
Lecture: Drug utilization studies. Classification of outcome and exposure, Database and Data mining in practice.

3rd week:
Lecture: Measures of association, Population Attributable Risk

4th week:
Lecture: The analysis of “real life” data, assessments and trends based on big-datasets, by population

5th week:
Lecture: Systematic literature review, Methodology of a metaanalysis.

6th week:
Seminar: Practice of selected methodology

7th week:
Lecture: Quality of Life, questionnaires, VAS tests, validation

8th week:
Lecture: Cost of medicine, treatment, burden of diseases. Result, Efficacy and Efficiency

9th week:
Lecture: Cost of prevention in medicine, the results of changes in life-style

10th week:
Lecture: Health Technology Assessment: rationale and theory

11th week:
Lecture: The practice of Cost -benefits (CBA) and Cost-utility (CUA) analysis, ICER

12th week:
Seminar: Calculations in practice: investments and cost of drug development

Requirements

Concerning attendance of classes, the rules in the Regulations Governing Admission, Education and Examinations of the University of Debrecen are valid.
Participation in at least three(3) out of the 2 tests and two (2) practices are required for the signature. Those ones who failed will be required to pass the "semifinal test" in order to obtain signatures.
The exam will be written and oral exam at the end of the semester which covers all the topics of the semester. Writen part: Test and two topics from selected list of questions.
Grade (semifinal mark) The average of the three scores (1x Test, 2x Topics) compose the final mark (1-5 final grade).

Subject: **PHARMACOVIGILANCE**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: The concept and basic definitions in Pharmacovigilance. The tools and guidelines for agencies and for international cooperation.

2nd week:
Lecture: The basics of Drug safety and Benefits/risk evaluation. Signal detection.

3rd week:
Lecture: The process of safety reporting. Roles, responsibilities and participants of the national and EU pharmacovigilance systems. The effects of GPP on public health and economy.

4th week:
Lecture: Classification of side effects, adverse drug reactions. Drug and food interactions.

5th week:
Lecture: Pharmacovigilance during drug development process. Postmarketing drug safety: tools and methodology. Pharmacovigilance during drug development process. Postmarketing drug safety: tools and methodology. Pharmacovigilance during drug development process. Postmarketing drug safety: tools and methodology. Pharmacovigilance during drug development process. Postmarketing drug safety: tools and methodology.

Requirements

Concerning attendance of classes, the rules in the Regulations Governing Admission, Education and Examinations of the University of Debrecen are valid.
Conditions of signing the lecture book (by the end of semester): Participation in at least three (3) of the interim tests are required for the signature. The ones who failed will be required to pass the "end of semester test" in order to obtain signatures.

Exam (semifinal)
The exam will be written and oral exam at the end of the semester which covers all the topics of the semester taken in the lectures or seminars. Written part (TEST (single choice, multiple choice, short description or definitions, etc.) and an Oral part (Two topics from selected list of questions provided.) Grade (semifinal mark) The average of the three scores (Test, Topic-1 Topic-2) compose the final mark (1-5 grades).
Exemption (full or partial) may be earned - only for those student who had at least 70%, can be eligible to submit an: I.) Oral presentation or a II.) Written assay of selected topics.

Department of Pharmaceutical Technology

Subject: **BIOCOSMETICS**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: History of cosmetics I.

2nd week:
Lecture: History of cosmetics II.

3rd week:
Lecture: History of cosmetics III.

4th week:
Lecture: Biocosmetics, theory

5th week:
Lecture: Basic skin types.

6th week:
Lecture: Cosmetic changes on skin I.

7th week:
Lecture: Cosmetic changes on skin II.

8th week:
Lecture: Therapy of seborrhoea.

9th week:
Lecture: Decor cosmetics I.

10th week:
Lecture: Decor cosmetics II.

11th week:
Lecture: Tooth and mouth care.

12th week:
Lecture: Cosmetics preparations I.

13th week:
Lecture: Cosmetics preparations II.

14th week:
Lecture: Consultation
15th week:
Lecture: Consultation

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam.
Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn't attend 30% of lectures.

Subject: **DIETARY SUPPLEMENTS AND GENERAL NUTRIENTS**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

Subject: **GALENIC PREPARATIONS**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Ointments

2nd week:
Lecture: Suppositories

3rd week:
Lecture: Solutions

4th week:
Lecture: Suspensions

5th week:
Lecture: Emulsions

6th week:
Lecture: Official prescriptions 1-5

7th week:
Lecture: Official prescriptions 5-10

8th week:
Lecture: Official prescriptions 10-15

9th week:
Lecture: Official prescriptions 10-15

10th week:
Lecture: Official prescriptions 15-20

11th week:
Lecture: Official prescriptions 20-25

12th week:
Lecture: Official prescriptions 25-30

13th week:
Lecture: Official prescriptions 30-35

14th week:
Lecture: Official prescriptions 35-40

15th week:
Lecture: consultation

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam.

Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn't attend 30% of lectures.

Subject: **JURISTIC KNOWLEDGE FOR PHARMACISTS**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **14**

1st week:
Lecture: Introduction to Law – Norms, Mores and Folkways, Defining Law

2nd week:
Lecture: Families of Law, Functions of Law, Classification of Law

3rd week:
Lecture: Sources of Law, Principles for resolve conflicts of Law

4th week:
Lecture: Interpretation of Law, Dispute resolution

5th week:
Lecture: Law and Ethics in Pharmacy I. – The rights of the patient

6th week:
Lecture: Law and Ethics in Pharmacy II. – Moral principles in medical practice, Ethical Codes for Pharmacists

7th week:
Lecture: Health and Pharmaceutical Care, The 7 Star Pharmacist

8th week:
Lecture: The Good Pharmacy Practice

9th week:
Lecture: Pharmaceutical Legislation

10th week:
Lecture: International Health Organisations

11th week:
Lecture: Global Health Law I.

12th week:
Lecture: Global Health Law II.

13th week:
Lecture: Case Studies (Patient Rights, Ethics)

14th week:
Lecture: consultation

15th week:
Lecture: consultation

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam. Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn’t attend 30% of lectures.

Subject: **NANOPHARMACEUTICS**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: Introduction. Nanotechnology and Nanomedicine

2nd week:
Lecture: Investigation methods of nanotechnology and nanopharmaceutics.

3rd week:
Lecture: Nano-sized drug delivery systems 1. Liposomes.

4th week:
Lecture: Nano-sized drug delivery systems 2. Nanoparticles and nanotubes.

5th week:
Lecture: Nano-sized drug delivery systems 3. Unimolecular polymer and dendrimer conjugates.

6th week:
Lecture: Nano-sized drug delivery systems 4. Micellar systems, polymer micelles.

7th week:
Lecture: Nano-sized drug delivery systems 5. Antibodies and their conjugates.

8th week:
Lecture: Nano-sized drug delivery systems 6. Cyclodextrins.

9th week:
Lecture: Nano-sized drug delivery systems 7. Vectors for nucleic acid drug delivery.

10th week:
Lecture: Theranostics.

11th week:
Lecture: Pharmacokinetics and toxicology of nanopharmaceutics.

12th week:
Lecture: Interaction of nanopharmaceutics and biological barriers. Cellular internalization and intracellular behaviour of nanopharmaceutics.

13th week:
Lecture: Nanopharmaceutics: drugs in the therapy.

14th week:
Lecture: Consultation.

15th week:
Lecture: Test
Self Control Test

Requirements

Written test

Subject: **OPERATING SYSTEM OF THE PHARMACEUTICAL INDUSTRY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: Pharmaceutical quality system I.

2nd week:
Lecture: Pharmaceutical quality system II.

3rd week:
Lecture: Pharmaceutical industry and patent systems I.

4th week:
Lecture: Pharmaceutical industry and patent systems II.

5th week:
Lecture: CGMPS and the concepts of modern quality systems I.

6th week:
Lecture: CGMPS and the concepts of modern

quality systems II.

7th week:
Lecture: Pharmaceutical computer systems I.

8th week:
Lecture: Pharmaceutical computer systems II.

9th week:
Lecture: Pharmaceutical GMP regulations I.

10th week:
Lecture: Pharmaceutical GMP regulations II.

11th week:
Lecture: Generics I.

12th week:
Lecture: Generics II.

13th week:
Lecture: Marketing

14th week:
Lecture: Consultation

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam. Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn't attend 30% of lectures.

Subject: **PHARMACEUTICAL COMPUTER ADMINISTRATION**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Computer knowledge.

2nd week:
Lecture: Computer programs I.

3rd week:
Lecture: Computer programs II.

4th week:
Lecture: Computer programs in pharmacy I.

5th week:
Lecture: Computer programs in pharmacy II.

6th week:
Lecture: Computer programs in pharmacy III.

7th week:
Lecture: Computer programs in pharmacy IV.

8th week:
Lecture: Exam

9th week:
Lecture: Ordering program on computer (in pharmacy) I.

10th week:
Lecture: Ordering program on computer (in pharmacy) II.

11th week:
Lecture: Ordering program on computer (in pharmacy) III.

12th week:
Lecture: Administration on computer I.

13th week:
Lecture: Administration on computer II.

14th week:
Lecture: Consultation.

15th week:
Lecture: Exam

Requirements

Attendance of practicals is obligatory. Altogether two absences in the semester is permitted. After absence the practical should be made up. At the end of the semester students get 5-stage practical grade.
Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student is absent from the practicals more than allowed in a semester

Subject: **SPECIAL TRAINING COURSE - CLINICAL PHARMACOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

Subject: **SPECIAL TRAINING COURSE - INDUSTRIAL PHARMACEUTICAL TECHNOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

Subject: **SPECIAL TRAINING COURSE - SYNTHETIC CHEMICAL**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

Subject: **SPECIAL TRAINING COURSE - TOXICOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: 1. Introduce pharmacy rooms. Division of pharmacy, instruments, equipments.2. Storage of drug preparations, requirements. chemical substances, drugs, galenicals, registered preparations, drugs with strong effect, Study those chemicals studied at the University, materials knowledge, nomenclature3. Reading of Prescriptions, pharmaceutical Latin.

2nd week:
Lecture: 4. Instruments used in Pharmacy, pharmacy balances, small equipments etc. description, cleaning, maintenance.5. Requirements for packaging of pharmaceutical preparations. Choosing the suitable containers.

Packaging materials. Glass, plastic containers, closures. Signatures.

3rd week:
Lecture: 6. Simple processes of pharmaceutical technology (measuring, sieving, mixing of powders, dilution, concentration calculation of solutions, other simple calculations needed for parmaceutical work.7. Technical books of pharmacy. (H.Ph. VII., H.Ph.VIII., Eur. Ph. 7., FoNoVII.)

4th week:
Lecture: 8. Tests, investigations according to the Eur. Ph. 7.9. Connection with patients. Take part in pharmacy dispensing.

Subject: **STATE EXAM PRACTICE I. PHARMACY DISPENSING**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Practical: **120**

1st week:
Lecture: Theoretical and practical knowledge of registered drug preparations, galenicals, magistral preparations,

2nd week:
Lecture: individual prescriptions

3rd week:
Lecture: dosage forms.

4th week:
Lecture: the theoretical and practical knowledge of vaccines, immunosera, and sutures for human and veterinary use

5th week:
Lecture: The basic knowledge of medical aid products, equipments and machines for pharmaceutical preparations.

6th week:
Lecture: Basic knowledge of pharmacy management,

7th week:
Lecture: pharmaceutical affairs organizations and juristic knowledge for pharmacists. Pharmacy organizations.

8th week:
Lecture: Knowledge of measurement conversion and the International System of Units (SI). Basic knowledge of biopharmacy, pharmacology and pharmacognosy. Control of pharmaceutical preparations.

Requirements

Syllabus for the practice in a public pharmacy before final examination
Duration of the practice is 2+3 months, 8 hours daily, from which two hours may be spent on preparing individually. Pharmacy students should gain experience on the following areas in a general pharmacy during their practice and subsequently acquire knowledge about pharmacy operation including: dispensing medication, preparing medication, validation and quality assurance, and the overall operation of the pharmacy.

Requirements for the student:
Accept and sign the non-disclosure document. Absence from practice must be authentically justified based on the rules of the place of training. Absences must be made up. He/she is expected to follow

the guidance of the pharmacist in charge of the training. The expected skills made on the student after completion of the practice:
• practical application of the theoretical knowledge obtained during his / her studies,
• the knowledge of the practical application of the rules and regulations concerning the operation of pharmacies,
• he / she is required to have an appropriate working relationship with the co-workers at the pharmacy
• he/ she is expected to communicate with the patients in an appropriate way,
• he / she is required to appropriately inform and give advice in connection with the patients' questions regarding self-healing and preparations without prescription (drugs and other products), • He / she is required to identify „problematic patients" from the point of view of communication and to handle situations properly with help. The student's tasks during the practice: Under the supervision and instructions of the pharmacist in charge of the training he / she participates in the following activities:

1. Drug Dispense. In the process he / she is required to learn:
• how to check the content and layout of the prescription
• the application of the rules regarding the replacement of drugs, ordering of drugs on the basis of international non-proprietary name,
• appropriate patient information knowing the effects and adverse effects of drugs,
• recognition and evaluation of the characteristic interactions based on database (drug-drug, drug-food, drug-food supplement),
• characteristic/obligatory cases and methods of medical information and consultation,
• duties in connection with the known/identified adverse effects of drugs,
• adherence control and means of correction, common uses,
• the typical cases of self-healing, the dispensing of the preparations without prescription that can be applied for this purpose,
• the possibilities and rules of access to data regarding the patients' previous medication (OEP database),
• the database of nutrition complements and medicinal formulae
• proper application of the labelling and dispensing computer program.

2. Preparation of medicine. In the process he / she is required to learn:
• How to prepare magistral / individual formulations according to the rules and to recognize incompatibilities
• The legal possibilities of changing the original prescription
• The rules of labelling and their application (identifiability of manufacturer and patient, application, administration, shelf-life)
• Documentation of preparation, and administrative obligations
• Storage of materials, processing of basic formulations and subsequent administrative obligations
• Formulations of the compendium and FoNo

3. Operation, quality assurance. In the process he / she is required to learn:
• administrative work in the pharmacy
• the rules concerning the staff of the pharmacy; qualification, labor law requirements, •standard procedures for workflow
• how to check and document workflow
• the rules pertaining to the examining and sampling incoming medications,
• documentation of examinations

4. Medication management. In the process he / she is required to learn:
• aspects of inventory management,
• how to order medicine
• duties in case of waste products, returned items, damage,
• withdrawal of products from circulation,
• duties regarding shift of prices, •closings: daily, weekly, periodic as well as schedule of OEP reports,
• importance and practice of supervision of prescriptions,
• about narcotics and activities involving their handling,
• the rules pertaining to hazardous waste. Evaluation: Keeping an electronic workbook: the description of two practical problems in half/one page weekly. One of them should describe a question related to the patient (dispensing drugs), the other topic can be chosen from the three other areas (preparation of medicine, operation, medication management). The descriptions made during the practice should be concerned with all the areas of the activities at a pharmacy. The pharmacist in charge of the training checks the work and description every week and evaluates it using a five-grade system. He / She sends the electronic notebook to the Dean's Office according to the rules of the place of training. The student is required to make a 10-15-minute-long presentation for the co-workers of the pharmacy from a professional scientific journal recommended by the pharmacist in charge of the training (the documentation of which will be kept in the workbook) on one occasion. The presentation will take place on a date agreed on by the training location and the student. At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place. Student evaluation: After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

Subject: **STATE EXAM PRACTICE I. PRESCRIPTION PHARMACY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Practical: **120**

Requirements

Duration of the practice is 2+3 months, 8 hours daily, from which two hours may be spent on preparing individually.
Pharmacy students should gain experience on the following areas in a general pharmacy during their practice and subsequently acquire knowledge about pharmacy operation including: dispensing medication, preparing medication, validation and quality assurance, and the overall operation of the pharmacy.

Accept and sign the non-disclosure document.
Absence from practice must be authentically justified based on the rules of the place of training.
Absences must be made up.
He/she is expected to follow the guidance of the pharmacist in charge of the training.

- practical application of the theoretical knowledge obtained during his / her studies

- the knowledge of the practical application of the rules and regulations concerning the operation of pharmacies
- he / she is required to have an appropriate working relationship with the co-workers at the pharmacy
- he/ she is expected to communicate with the patients in an appropriate way
- he / she is required to appropriately inform and give advice in connection with the patients'
- questions regarding self-healing and preparations without prescription (drugs and other products),
- he / she is required to identify „problematic patients" from the point of view of communication and to handle situations properly with help.

Under the supervision and instructions of the pharmacist in charge of the training he / she the following activities:

1. Drug Dispense. In the process he / she is required to learn:
- how to check the content and layout of the prescription
- the application of the rules regarding the replacement of drugs, ordering of drugs on the basis of international non-proprietary name
- appropriate patient information knowing the effects and adverse effects of drugs
- recognition and evaluation of the characteristic interactions based on database (drug-drug, drug-food, drug-food supplement)
- characteristic/obligatory cases and methods of medical information and consultation
- duties in connection with the known/identified adverse effects of drugs
- adherence control and means of correction, common uses
- the typical cases of self-healing, the dispensing of the preparations without prescription that can be applied for this purpose,
- the possibilities and rules of access to data regarding the patients' previous medication (OEP database)
- the database of nutrition complements and medicinal formula
- proper application of the labelling and dispensing computer program.

2. Preparation of medicine. In the process he / she is required to learn:
- How to prepare magistral / individual formulations according to the rules and to recognize incompatibilities
- The legal possibilities of changing the original prescription
- The rules of labelling and their application (identifiability of manufacturer and patient, application, administration, shelf-life)
- Documentation of preparation, and administrative obligations
- Storage of materials, processing of basic formulations and subsequent administrative obligations
- Formulations of the compendium and FoNo

3. Operation, quality assurance. In the process he / she is required to learn:
- administrative work in the pharmacy
- the rules concerning the staff of the pharmacy; qualification, labor law requirements,
- standard procedures for workflow
- how to check and document workflow
- the rules pertaining to the examining and sampling incoming medications
- documentation of examinations

4. Medication management. In the process he / she is required to learn:
- aspects of inventory management
- how to order medicine
- duties in case of waste products, returned items, damage
- withdrawal of products from circulation
- duties regarding shift of prices,
- closings: daily, weekly, periodic as well as schedule of OEP reports
- importance and practice of supervision of prescriptions
- about narcotics and activities involving their handling
- the rules pertaining to hazardous waste

Keeping an electronic workbook: **the description of two practical problems in half/one page weekly**. One of them should describe a question related to the patient (dispensing drugs), the other topic can be chosen from the three other areas (preparation of medicine, operation, medication management). The descriptions made during the practice should be concerned with all the areas of the activities at a pharmacy. The pharmacist in charge of the training checks the work and description every week and evaluates it using a five-grade system. He / She sends the electronic notebook to the Dean's Office according to the rules of the place of training.
The student is required to make a 10-15-minute-long presentation for the co-workers of the pharmacy from a professional scientific journal recommended by the pharmacist in charge of the training (the documentation of which will be kept in the workbook) on one occasion. The presentation will take place on a date agreed on by the training location and the student.
At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place.

After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

Subject: **STATE EXAM PRACTICE II. – PHARMACEUTICAL MANAGEMENT, QUALITY ASSURANCE**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **60**

Subject: **STATE EXAM PRACTICE II. (PHARMACEUTICAL BUSINESS ADMINISTRATION)**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **60**

Subject: **STATE EXAM PRACTICE II. INSTITUTIONAL PHARMACY OR GALENIC LABORATORY**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **120**

Requirements

Duration of the practice is 2+3 months, 8 hours daily, from which two hours may be spent on preparing individually.
Pharmacy students should gain experience on the following areas in a general pharmacy during their practice and subsequently acquire knowledge about pharmacy operation including: dispensing medication, preparing medication, validation and quality assurance, and the overall operation of the pharmacy.

Accept and sign the non-disclosure document.
Absence from practice must be authentically justified based on the rules of the place of training. Absences must be made up.
He/she is expected to follow the guidance of the pharmacist in charge of the training.

- practical application of the theoretical knowledge obtained during his / her studies
- the knowledge of the practical application of the rules and regulations concerning the operation of pharmacies
- he / she is required to have an appropriate working relationship with the co-workers at the pharmacy
- he/ she is expected to communicate with the patients in an appropriate way
- he / she is required to appropriately inform and give advice in connection with the patients' questions regarding self-healing and preparations without prescription (drugs and other products),
- he / she is required to identify „problematic patients" from the point of view of communication and to handle situations properly with help.

Under the supervision and instructions of the pharmacist in charge of the training he / she the following activities:

1. Drug Dispense. In the process he / she is required to learn:
- how to check the content and layout of the prescription
- the application of the rules regarding the replacement of drugs, ordering of drugs on the basis of international non-proprietary name
- appropriate patient information knowing the effects and adverse effects of drugs,
- recognition and evaluation of the characteristic interactions based on database (drug-drug, drug-food, drug-food supplement)
- characteristic/obligatory cases and methods of medical information and consultation,
- duties in connection with the known/identified adverse effects of drugs
- adherence control and means of correction, common uses
- the typical cases of self-healing, the dispensing of the preparations without prescription that can be applied for this purpose,
- the possibilities and rules of access to data regarding the patients' previous medication (OEP database)

- the database of nutrition complements and medicinal formula
- proper application of the labelling and dispensing computer program.

2. Preparation of medicine. In the process he / she is required to learn:
- The legal possibilities of changing the original prescription
- The rules of labelling and their application (identifiability of manufacturer and patient, application, administration, shelf-life)
- Documentation of preparation, and administrative obligations
- Storage of materials, processing of basic formulations and subsequent administrative obligations
- Formulations of the compendium and FoNo

3. Operation, quality assurance. In the process he / she is required to learn:
- administrative work in the pharmacy
- the rules concerning the staff of the pharmacy; qualification, labor law requirements,
- standard procedures for workflow
- how to check and document workflow
- the rules pertaining to the examining and sampling incoming medications,
- documentation of examinations

4. Medication management. In the process he / she is required to learn:
- aspects of inventory management
- how to order medicine
- duties in case of waste products, returned items, damage
- withdrawal of products from circulation
- duties regarding shift of prices
- closings: daily, weekly, periodic as well as schedule of OEP reports
- importance and practice of supervision of prescriptions
- about narcotics and activities involving their handling
- the rules pertaining to hazardous waste.

Keeping an electronic workbook: **the description of two practical problems in half/one page weekly**. One of them should describe a question related to the patient (dispensing drugs), the other topic can be chosen from the three other areas (preparation of medicine, operation, medication management). The descriptions made during the practice should be concerned with all the areas of the activities at a pharmacy. The pharmacist in charge of the training checks the work and description every week and evaluates it using a five-grade system. He / She sends the electronic notebook to the Dean's Office according to the rules of the place of training.
The student is required to make a 10-15-minute-long presentation for the co-workers of the pharmacy from a professional scientific journal recommended by the pharmacist in charge of the training (the documentation of which will be kept in the workbook) on one occasion. The presentation will take place on a date agreed on by the training location and the student.
At the end of the practice the pharmacist in charge of the training evaluates the student's overall practical work on an assessment sheet in written form and evaluates the student based on a three-grade system. He / she sends it to the Dean's Office in a printed and signed form according to the rules of the training place.

After the practice the student fills in a questionnaire pertaining to the training place and the pharmacist in charge of the training according to the rules of the training facility.

Subject: **STATE EXAM PRACTICE II. PHARMACY DISPENSING**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **120**

Subject: **STATE EXAM PRACTICE II. PRESCRIPTION PHARMACY**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **120**

1st week:
Lecture: Technical books of pharmacy. (H.Ph. VII., H.Ph.VIII., Eur. Ph. 7., FoNoVII.)

2nd week:
Lecture: Nomenclature,

3rd week:
Lecture: reading of prescriptions

4th week:
Lecture: materials knowledge

5th week:
Lecture: calculations

6th week:
Lecture: computer program.

7th week:
Lecture: Theoretical and practical knowledge of registered drug preparations

8th week:
Lecture: Basic knowledge of pharmacy management, pharmaceutical affairs organizations and juristic knowledge for pharmacists.

9th week:
Lecture: Pharmacy organizations.

10th week:
Lecture: The basic knowledge of medical aid products, equipments and machines for pharmaceutical preparations.

11th week:
Lecture: the theoretical and practical knowledge of vaccines, immunosera, and sutures for human and veterinary use.

12th week:
Lecture: Consultation

13th week:
Lecture: The students need to practice the medium scale pharmaceutical technology operations.

14th week:
Lecture: Equipments and machines for medium scale pharmaceutical technology operations.

15th week:
Lecture: Students might learn the process of special pharmaceutical dosage forms for inpatients. (e.g.: infusions, injections, individual compositions).

16th week:
Lecture: Consultation

Subject: **THESIS**
Year, Semester: 5th year/2nd semester
Number of teaching hours:

Subject: **THESIS CONSULTATION**
Year, Semester: 5th year/1st semester
Number of teaching hours:

Subject: **VETERINARY HYGIENE**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Basics of veterinary hygiene I.

2nd week:
Lecture: Basics of veterinary hygiene II.

3rd week:
Lecture: Basics of veterinary hygiene III.

4th week:
Lecture: Basics of veterinary hygiene IV.

5th week:
Lecture: Formule Normales Veterinariae III

6th week:
Lecture: Preparations from Formule Normales Veterinariae III

9th week:
Lecture: Veterinary illness and therapy I.

10th week:
Lecture: Veterinary illness and therapy II.

11th week:
Lecture: Veterinary illness and therapy III.

12th week:
Lecture: Test

13th week:
Lecture: Zoonisis-animal diseases transmissible to humans

14th week:
Lecture: Zoonisis-animal diseases transmissible to humans II.

15th week:
Lecture: Consultation

Requirements

Students have to attend 30% of the lectures. All materials covered in lectures is an integral part of the subject and therefore included in the self-control test and the final exam.
Requirements for signing the Lecture book: The Department may refuse to sign the lecture book if the student didn’t attend 30% of lectures.

Department of Pharmacology

Subject: **PHYTOPHARMACOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **24**

Requirements

Attendance at 50% of lectures is a requirement for acceptance of the semester. Before the end of the semester students have to take a written exam. Requirement on this written exam is at least 60% for the signature of the Lecture Book for the semester and for the student to be allowed to take the End of Semester Exam (ESE). At the end of the semester students take End of Semester Exam (ESE) which is oral. During the semester there is an opportunity to be freed from the constraint of the End of Semester Exam. Students are offered the grade of the written exam passed during the semester if it is at least good (80%) or excellent (90%). Correction of the offered grade is in the form of taking the oral End of Semester Exam instead. The result of the exam can be better or even worse than the offered grade.

Department of Physical Chemistry /MTA-DE Homogeneous Catalysis and Reaction Mechanisms Research Group

Subject: **POLYMORPHISM OF PHARMACEUTICALS**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Introduction. Polymorphism, definition. Polymorphism in everyday life and pharmaceutical industry. Analytical methods. Ritonavir and cefuroxime.

2nd week:
Lecture: Thermodynamics. Basics of thermoanalytical methods and their application in polymorph research. Monotrope and enantiotrope systems.

3rd week:
Lecture: Patent literature basics. Claims. Polymorphs in the patents. Ranitidine hydrochloride and paroxetine hydrochloride.

4th week:
Lecture: Thermodynamics and kinetics of crystallization. Controlling polymorph composition. The Aspartame case.

5th week:
Lecture: Computational chemistry. Polymorph prediction.

6th week:
Lecture: Basics of X-ray diffraction. Powder diffraction methods. Quantitative XRPD.

7th week:
Lecture: Single crystal X-ray diffraction. Structure of polymorphs. The hydrogen bond.

8th week:
Lecture: Ab initio structure determination from powder diffraction data. Indexing, - Rietveld refinement.

9th week:
Lecture: Solid state NMR basics. ssNMR in polymorph research.

10th week:
Lecture: FT-IR and Raman spectroscopy and microscopy. ATR techniques.

11th week:
Lecture: Polymorphism - quality control issues

12th week:
Lecture: Polymorphism of dyes and explosives.

13th week:
Lecture: Crystallographic databases. CSD, polymorph structures in the Database.

14th week:
Lecture: Regulatory questions of polymorphism. FDA, ICH, EMEA rules, Q6A.

15th week:
Lecture: Conclusion. Case studies. Polymorphism of chocolate.

Requirements

Entrance conditions: successful final exam on Pharmaceutical technology II., at least 5 students

Department of Physiology

Subject: **MODERN TECHNIQUES ALLOWING THE INVESTIGATION OF PHYSIOLOGICAL PHENOMENA**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **24**

1st week:
Lecture: The lectures are listed at the web site of the Department of Physiology (http://phys.dote.hu)

Requirements

1. **Signature of Lecture Book**
Lecture attendance may be followed up by the Department. The lecture will not be delivered if 5 or fewer students show up. Nevertheless, the lecture material is going to be asked in the final assessment.
For continuous updates on all education-related matters, please check the departmental web-site (http://phys.dote.hu)

2. **Evaluation during the semester**
None.

3. **Examination**
At the end of the course a written final assessment will be organised in the form of multiple choice questions. The result of this assessment will determine the verification mark of the credit course using the following conversion table:

0-39.9% -	Failed
40-54.9 -	Pass
55-69.9% -	Satisfactory
70-84.9% -	Good
85-100% -	Excellent

Subject: **PROBLEM BASED LEARNING IN PHYSIOLOGY**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **30**

1st week: **Practical:** The practices are listed at the web site of the Department of Physiology	(http://phys.dote.hu)

Requirements

Aims of the course:
The program offers carefully selected and designed problems from the field of Physiology. Students can learn how to apply problem solving approach, self-conducted strategy and analytic thinking in resolving selected problems. Skill in team-work is helpful in the program.

RULES FOR THE PROBLEM BASED LEARNING (PBL) CREDIT COURSE

1. The program is conducted between 3rd and 11th academic weeks of the second semester.

2. Students must have a tutor, this is the prerequisite for the program. Tutor can be any professor of the Department, not only her/his seminar/practical instructor. The applicant should contact the chosen professor and request him/her to undertake the tutorship. Professors of the Department maintain the right to accept or refuse to be the tutor of the applicant.

3. Special Rule: the applicant has to organize the chosen project and register at the tutor (NOT via NEPTUN) until the end of second academic week. Applications after the second week are not accepted.

4. Preconditions for the program: mark three (3) or better in Physiology I, successful closing lab and permission of the Department (arranged by the tutor).

5. The maximum number of participants in the program cannot exceed 100 students. In case, the number of applicants is higher than 100, the seminar/practical instructor or the course coordinator can refuse applicants with mark three or better. The name of the students registered to the program is published on the website of Department of Physiology on the 3rd academic week.

6. Two students works in team on one project, and prepare one mutual report, thus they get the same score at the end of the program regardless their contribution. The Journal Club and Lab Visit programs are carried out individually.

7. Evaluation of the students is based on the written report or the oral presentation using five grade score system (1-5). Grades are final, no make-up is allowed.

8. The list of offered programs are available at the practical lab of the Department or on the Department's homepage (http://phys.dote.hu/files/oktatas/kredit/PMO/PBL_topics.pdf).

9.The deadline for the program is the end of the 11th academic week. Reports should be submitted to the tutor. Missing the deadline automatically results grade 1 (fail).

10. Detailed information for the program can be accessed on the website of the Department (http://phys.dote.hu).

Subject: **THE REGULATORY ROLE OF THE CELL MEMBRANE IN PHYSIOLOGICAL AND PATHOLOGICAL CONDITIONS**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **20**

1st week:
Lecture: The lectures are listed at the web site of the Department of Physiology (http://phys.dote.hu)

Requirements

1. **Signature of Lecture Book**
Lecture attendance may be followed up by the Department. The lecture will not be delivered if 5 or fewer students show up. Nevertheless, the lecture material is going to be asked in the final assessment.
For continuous updates on all education-related maters, please check the departmental web-site (http://phys.dote.hu)

2. **Evaluation during the semester**
None.

3. **Examination**
At the end of the course a written final assessment will be organised in the form of multiple choice questions. The result of this assessment will determine the verification mark of the credit course using the following conversion table:

0-39.9% -	Failed
40-54.9 -	Pass
55-69.9% -	Satisfactory
70-84.9% -	Good
85-100% -	Excellent

Division of Emergency Medicine

Subject: **FIRST AID AND REANIMATION**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **7**
Practical: **8**

1st week:
Lecture: Definition of "first aid"; first aid levels; time factor; behavior of first responder in the field; the emergency call

2nd week:
Lecture: Unconsciousness; airway obstruction; airway opening maneuvers.

3rd week:
Lecture: Death as a process; determining of clinical death; the different oxygen demand of the brain depending on age; establishing unconsciousness or death; assessment of vital signs; assessment of breathing, circulation, pupils and muscle tone

4th week:
Lecture: Reanimation on the spot – organization problems; the theory of CPR; complications during the CPR; effect, results and success during CPR

5th week:
Lecture: Examination of breathing and circulation; the chest-thrust; airway opening maneuvers; the recovery position (Gábor maneuver); one hour

6th week:
Practical: Practicing the ventilation (one hour)

7th week:
Practical: Practicing the chest compression (one hour)

8th week:
Practical: CPR training without equipment (two hours)

9th week:
Practical: CPR training, two-rescuer method (two hours)

10th week:
Practical: Bleeding control with direct pressure and pressure point techniques; bandages and fixation; equipments, tools and maneuvers; general rules of provisory injury therapy; pressure bandage for controlling of arterial and venous bleeding on the spot (two hours)

11th week:
Practical: Bandages for head, nose; ears, eyes; chin, body and extremities; practicing the bandages (two hours)

12th week:
Practical: First aid in fractures, luxations, distortions and extended soft-tissue injuries; bandage for fixation with special triangle; Schantz collar; stifneck; Dessault bandage; fixation of finger and hand fractures; usage of Kramer splint and pneumatic splint (two hours)

13th week:
Practical: CPR training (two hours)
Self Control Test

14th week:
Lecture: Burning; first aid in burning diseases; shock

15th week:
Lecture: Intoxication; guideline of poisoning in toxicology; typical intoxications, special signs, first aid

Requirements

Condition of signing the Lecture book:
Attendance at practices is compulsory. The tutor may refuse to sign the Lecture book if the student is absent from the practices more than twice in a semester. Missed practices should be made up for after consultation with the practice tutor. Facilities for a maximum of 2 make-up practices are available at the Ambulance Station in Debrecen. The current knowledge of students will be tested two times in each semester in written test.

Division of Operative Techniques and Surgical Research

Subject: **BASIC KNOWLEDGE OF SURGICAL BIOMATERIALS FOR STUDENTS OF PHARMACY**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **8**
Seminar: **16**
Practical: **8**

1st week:
Lecture: General and surgical deontology. Surgical armamentarium
Seminar: Cutting, hemostatic, grasping-retracting, special and suturing instruments. Order of the instrumental trays and tables. Handling and sterilization of the instruments.

2nd week:
Lecture: Wound closure and the required surgical biomaterials.
Seminar: Classification, package, application fields, storage, sterilization and quality control of suture materials.
Practical: Surgical needles, suture materials, knotting and suturing techniques.

3rd week:
Lecture: Operating room environment, order of the operating work. Scrubbing and the required materials. Preparations for the operation, isolation of the operative field.
Seminar: Instrumental order on the operative tables. Disinfection and isolation of the operative field.
Practical: Scrubbing. Wound closure with different suturing techniques on surgical training models.

4th week:
Lecture: Hemostasis. Methods and the required materials. Injection techniques and blood sampling. Punction, preparation and cannulation of vessels.
Seminar: Basics of hemorheology.
Practical: Ligation of vessels on gauze models. Vein preparation/cannulation, injection techniques (i.m., i.v.) and taking blood samples on phantom models.

5th week:
Lecture: Fluid substitution. Infusion solutions and their application. Blood preparations. Enteral and parenteral nutrition.
Seminar: Different types of infusion accessories. Demonstration of the infusion pump. Preparing mixture infusion, calorie calculation.
Practical: Preparing the infusion set and connecting it to the venous catheter. Different types and use of blood pressure gauge.

6th week:
Lecture: Surgical incisions and laparotomies. Endoscopic techniques. Basic principals of intestinal surgery.
Seminar: Video-demonstration of laparotomies. Wound types. Principles of wound care. Wound dressings. Definition, types and application of catheters and drains. Catheterization of urinary

bladder. Incontinence and its treatment. Urine condoms. Types and handling of stoma bags.

7th week:
Lecture: Insight into the surgery of the parenchymal organs. Bioplasts and tissue adhesives and their application field. Conicotomy, tracheostomy. Basic principles of vascular surgery.
Seminar: Application of tissue adhesives and bioplasts. Conicotomy and tracheostomy. Reconstruction of blood vessel and the required biomaterials (video demonstration).

8th week:
Lecture: Ethical issues for animal research. Animal care, ethical problems, permissions. Keeping and treatment of experimental and laboratory small animals (mouse, rat). Narcosis and anesthesia of experimental animals. Intraoperative monitoring, registration of various parameters.
Seminar: Requirements of ISO, GLP. Preclinical experiments in pharmacology. Technique of dissection of isolated organs (heart, vessel, muscle, bowel preparates). In vivo techniques and models. Extermination, autopsy and taking samples of experimental animals.
Self Control Test

Requirements

Prerequisite: Pharmaceutical technology IV. theory and practice

Aim of the subject:
The main aim is to acquire up-to-date theoretical and practical knowledge that is appropriate to the modern age and the students can get acquainted with the basic methods, that can help the pharmacists to be familiar with the basic surgical interventions and the required materials during their work. The students have to learn the characteristics and the means of application of the biomaterials (suturing materials, bioplasts, tissue adhesives, catheters, drains, stoma bags, urine condoms, incontinence pads) that can be used during the surgical practice. They should have the knowledge of the manual interventions that they may need during pharmacological experimental work. A further aim is to improve manual skills. They have to possess the basic knowledge and skills for catastrophe, in order to be capable to help in manual (operative) - often life-saving - activity. They should have the basic knowledge to be able to inform patients, which is part of the work done by the dynamic team of a doctor and pharmacist.

Requirements:
The practices are based on the lectures, so the students can hardly meet the requirements at the practices without theoretical knowledge. The lectures and seminars/practices are strictly built on each other, so it is difficult to make up missed classes. Compensation for missed seminars/practices should be according to the Rules and Regulations of the University of Debrecen. If the student is absent from more than 20% of all teaching hours (6 out of 32) without any acceptable reason, the Department may refuse to sign the Lecture Book. Besides the suggested reading materials the hand-outs are also part of the curriculum. Performance is assessed on the five-grade scale (AW5) and it is based on the work though the curriculum and completion of the final written test at the end of the course.

Faculty of Pharmacy

Subject: **INTRODUCTION TO SCIENTIFIC RESEARCH**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **15**

Kenézy Life Sciences Library, University of Debrecen

Subject: **LIBRARY SYSTEM**
Year, Semester: 1st year/1st semester
Number of teaching hours:
Practical: **10**

1st week:
Practical: Introduction to the Library and library use:
- Traditional services (registration, rules of library usage, loans, reading room, computer lab).
- Electronic services (the Library's home page, online catalogs, anatomy databases and links).

2nd week:
Practical: Electronic Information Resources:
- Electronic journals (EBSCO A-to-Z, Science Direct).
- EBSCOhost Research Data-bases.
- Link collections.

3rd week:
Practical: Databases:
- Medline.
- Impact Factors.

4th week:
Practical: Evidence Based Medicine Synopsis of information retrieval

5th week:
Practical: Test

Requirements

Class attendance!

CHAPTER 22
TITLES OF THESES

Department of Anatomy, Histology and Embryology

1. Title: Inhibition mediated by GABAA and GABAB receptors in the superficial spinal dorsal horn in health and disease
2. Title: Molecular organization of the endogenous cannabinoid signaling apparatus in the superficial spinal dorsal horn in health and disease
Tutor: Miklós Antal M.D., Ph.D., D.Sc.

3. Title: Role of the extracellular matrix in the plasticity of the vestibular system.
4. Title: Termination of the vestibulospinal tract in the rat
Tutor: Klára Matesz M.D., Ph.D., D.Sc.

5. Title: Dendritic impulse propagation in mice showing symptoms of Alzheimer's disease – computer modelling
Tutor: Ervin Wolf M.Sc., Ph.D.

6. Title: Basic mechanisms of visual contour integration in the primary visual cortex using voltage sensitive dye imaging.
7. Title: Dendritic integration of inhibitory and excitatoty cortico-cortical inputsin the primary visual cortex
8. Title: Functional mapping of callosal inputs on the dendritic arbour of neurons in the visual cortex
9. Title: Mapping horizontal connections in the human brain.
10. Title: Synaptic mapping of identified excitatory and inhibitory neurons in the primary visual cortex. Immun-electron microscopic study.
Tutor: Zoltán Kisvárday M.Sc., Ph.D., D.Sc.

11. Title: Investigation of signaling mechanisms that regulate cartilage maturation
Tutor: Róza Zákány M.D., Ph.D.

12. Title: Investigation of neuronal network development in the spinal cord
Tutor: Zoltán Mészár M.Sc., Ph.D.

13. Title: Investigation of PACAP signalling in skeletal tissues
Tutor: Tamás Juhász M.Sc., Ph.D.

14. Title: Identification of genes and proteins which play important role in the induction and maintenance of chronic inflammatory pain.
Supervisior: Krisztina Hollo MSc, PhD
Tutor: Krisztina Holló M.Sc., Ph.D.

15. Title: Correlative physiological and morphological investigation of propriospinal connections in the spinal dorsal horn
Tutor: Zsófia Antal M.D., Ph.D.

Department of Biochemistry and Molecular Biology

1. Title: Apoptosis of differentiating adipocytes
2. Title: Development of effective recombinant tissue transglutaminase production systems. Development of assays to test transglutaminase activity. Studying superGTPase tissue transglutaminases.
Tutor: László Fésüs M.D., Ph.D., D.Sc., M.H.A.Sc.

3. Title: Genetic modification of mesenchymal stem cells and differentiation into macrophages.
4. Title: Investigation of the phagocytosis of apoptotic cells
5. Title: The anti-inflammatory role of adenosine A2A receptor.
6. Title: The anti-inflammatory role of membrane-bound TNFalpha
7. Title: The potential role of LXR receptor in the dexamethasone-induced phagocytosis of apoptotic cells.
8. Title: The role of adenosine A3 receptor in mediating anti-inflammatory action of apoptotic cells.
9. Title: The role of transglutaminase 2 in calcium homeostasis.
Tutor: Zsuzsa Szondy M.D., Ph.D., D.Sc.

10. Title: The role of retroviral proteases in the retroviral life cycle.
Tutor: József Tőzsér M.Sc., Ph.D., D.Sc.

11. Title: The role of tissue transglutaminase in rolling and adhesion of neutrophil granulocytes
Tutor: Zoltán Balajthy M.Sc., Ph.D.

12. Title: Saliva biomarkers of oral cancer.
Tutor: Beáta Scholtz M.Sc., Ph.D.

13. Title: Production of dendritic cells and macrophages from embryonic stem cells.
14. Title: Transcriptional reprogramming of murine embryonic stem cell progenitors.
Tutor: István Szatmári M.Sc., Ph.D.

15. Title: The epigenetic components of transcriptional regulation.
Tutor: Bálint Bálint L. M.D., Ph.D.

16. Title: Modification of the enzymatic activity of transglutaminase 2 by site-directed mutagenesis. Therapeutic utilization of modified transglutaminase 2.
Tutor: Róbert Király M.Sc., Ph.D.

17. Title: Quantitative proteomic analysis of the tear proteins of diabetic patients.
Tutor: Éva Csősz M.Sc., Ph.D.

18. Title: Identification of regulatory SNPs in promoter regions of different species by bioinformatic analyses.
Tutor: Endre Barta M.Sc., Ph.D.

19. Title: The role of aim2 protein and native immune response in inhibiting cell proliferation
Tutor: Máté Demény M.D., Ph.D.

20. Title: Alterations in structural properties of the transcription machinery in relation to disease development
21. Title: Molecular factors in cell differentiation
22. Title: Studying the re-programming mechanisms of viral proteins.
23. Title: The role of signaling pathway perturbations in cancer development
Tutor: Mónika Fuxreiter M.Sc., Ph.D., D.Sc.

Department of Biophysics and Cell Biology

1. Title: Investigation of cell surface distribution of erbB-2 oncoprotein in breast tumor cell lines.
2. Title: Role of tumor stem cells in trastazumab resistant breast tumors
Tutor: János Szöllősi M.Sc., Ph.D., D.Sc.

3. Title: Studying the inactivation of voltage gated potassium ion channels in heterologous expression systems.
Tutor: György Panyi M.D., Ph.D., D.Sc.

4. Title: Epigenetic regulation of nucleosome-DNA cohesion
5. Title: Interactions between ABC transporters and their membrane environment
Tutor: Gábor Szabó M.D., Ph.D., D.Sc.

6. Title: Mathematical analysis and computer modelling of the topology of cell surface proteins.
7. Title: Role of MHC in the organization of cell surface proteins
Tutor: László Mátyus M.D., Ph.D., D.Sc.

8. Title: Examination of the channel function properties of the P170 multidrug pump by patch-clamp.
Tutor: Zoltán Krasznai M.Sc., Ph.D.

9. Title: Cytometry of cytotoxic lymphocytes
10. Title: Physiological roles of the multidrug resistance transporter P-glycoprotein.
Tutor: Zsolt Bacsó M.D., Ph.D.

11. Title: Elucidation of the catalytic mechanism of ABC transporters
Tutor: Katalin Goda M.Sc., Ph.D.

12. Title: 3-dimensional reconstruction of chromosome conformations based on whole-genome contact probability data
13. Title: Histone point mutations affecting epigenetic modifications: impact on chromosome architecture
Tutor: Lóránt Székvölgyi M.Sc., Ph.D.

14. Title: Biophysical analysis and functional significance of cell surface protein patterns in T cell-mediated immune responses
Tutor: Andrea Dóczy-Bodnár M.Sc., Ph.D.

15. Title: Studying nuclear receptor function by modern microsocpy techniques
Tutor: György Vámosi M.Sc., Ph.D.

16. Title: Quantitative investigation of the associations of ErbB proteins using biophysical and molecular biological methods
17. Title: The correlation between the metastatic potential and chemoresistance of breast tumors with the expression level and association state of ErbB proteins
Tutor: Péter Nagy M.D., Ph.D.

18. Title: Molecular mechanisms of anticancer immune therapy.
19. Title: Role of molecular interactions between receptor tyrosine kinases and integrins in the therapy resistance of tumors.
Tutor: György Vereb M.D., Ph.D., D.Sc.

20. Title: Comparative study on Kv1.3 channels conjugated with fluorescent proteins
Tutor: Péter Hajdu M.Sc., Ph.D.

Department of Anesthesiology and Intensive Care

1. Title: Experimental testing of the neuromuscular junction
Tutor: Ákos Fábián M.D., Ph.D.

2. Title: Preemptive and preventive analgesia
Tutor: Béla Fülesdi M.D., Ph.D., D.Sc.

3. Title: Tako-tsubo cardiomyopathy in neurocritical care conditions
Tutor: Csilla Molnár M.D., Ph.D.

4. Title: Clinical studies in the field of neuromuscular block and its reversal
Tutor: Adrienn Pongrácz M.D., Ph.D.

Institute of Behavioural Sciences, Faculty of Public Health

1. Title: Basic issues of psy-complex (psychology, psychotherapy, psychiatry)
2. Title: Medicalization and its social context
3. Title: Sandor Ferenczi: Clinical Diary and the philosophy of doctor-patient relationship
4. Title: The importance of the point of view of psychoanalysis for a humanistic medicine.
Tutor: Attila Bánfalvi M.A., Ph.D., C.Sc.

5. Title: Inborn sociality-socialized individuality: the theory and its roots.
6. Title: Non-verbal behaviour: comparative analysis of biological and social aspects.
Tutor: Péter Molnár M.D., D.Sc.

7. Title: Ethical and legal issues of genetic research
8. Title: Ethical issues of research in the medical and health sciences
9. Title: Professional ethics and the system of gratitude money in Hungary
10. Title: The ethics of end-of-life decisions
Tutor: Péter Kakuk M.A., Ph.D.

11. Title: End of life decisions
Tutor: Sándor Kőmüves M.A., Ph.D.

12. Title: Evolutionary Psychopathology
13. Title: Humor and Mental Health
14. Title: Life History Strategy elements in mate choice, attachment, and mental health
Tutor: Roland Tisljár M.A., Ph.D.

15. Title: Psychological interventions in dental practice
Tutor: Eszter Tisljár - Szabó M.A., Ph.D.

Department of Inorganic and Analytical Chemistry

1. Title: Application of citrate buffers in clinical analysis and diagnosis. (A literature survey)
Tutor: Imre Tóth Ph.D., D.Sc., M.Sc.

2. Title: Experimental methods for the study of redox properties of copper(II) complexes (A literature survey)
Tutor: Katalin Várnagy M.Sc., Ph.D., D.Sc.

3. Title: The role of oxidation of biomolecules by catalysation of metal ions in the development and onset of neurodegenerative disorders. (A literature survey)
Tutor: Csilla Kállay M.Sc., Ph.D.

Department of Cardiology

1. Title: Ablation of atrial fibrillation
Tutor: Zoltán Csanádi M.D., Ph.D.

2. Title: CTO intervention
3. Title: Rotablation
Tutor: Tibor Szűk M.D., Ph.D.

4. Title: Echocardiographic aspects of left atrial appendage closure
5. Title: Fabry-disease
Tutor: Attila Kertész M.D., Ph.D.

6. Title: Device-therapy of heart failure
Tutor: Orsolya Bene M.D.

7. Title: Therapeutic hypothermia treatment after cardiac arrest
Tutor: László Fülöp M.D., Ph.D.

Division of Cardiac Surgery

1. Title: Evaluation of the antibacterial effect of different skin preparation techniques in cardiac surgery
Tutor: Tamás Szerafin M.D., Ph.D.
2. Title: The effect of carbon dioxide deairing during valve surgery - review of the literature
Tutor: Tamás Szerafin M.D., Ph.D.

3. Title: Short-term results of operations accomplished in A-type aortic dissections
Tutor: Tamás Maros M.D.

4. Title: Mitral valve repair-review of the literature
Tutor: István Szentkirályi M.D.

5. Title: Mid-term results of aortic valve sparing operations
Tutor: Ambrus Horváth M.D.

6. Title: Comparison of the effects of different anticoagulation therapies after aortic bioprothesis implantation.
Tutor: Lehel Palotás M.D.

Department of Preventive Medicine, Faculty of Public Health

1. Title: The use of Molecular genetic techniques for the detection of genom alterations in malignant diseases (review the literature)
Tutor: Margit Balázs M.Sc., Ph.D., D.Sc.

2. Title: Improve the mental health of university students
3. Title: Living conditions and health among vulnerable people
4. Title: Mental health of students
5. Title: Mental health of university students
Tutor: Karolina Kósa M.D., M.Sc., Ph.D.

6. Title: Monitoring type 2 diabetes design strategies
7. Title: Prevalence of type 2 diabetes (specific region)
Tutor: Attila Csaba Nagy M.D., Ph.D.

8. Title: Evaluation of foreign aid for the health sector in medium and low income countries
Tutor: János Sándor M.D., Ph.D.

Division of Cardiology

1. Title: Ablation in atrial fibrillation
2. Title: Novel treatment modalities in atrial fibrillation (catheter ablation, surgery and pacemakers)
Tutor: Zoltán Csanádi M.D., Ph.D.

3. Title: Flow calculation in 3D reconstructed coronary arteries
Tutor: Zsolt Kőszegi M.D., Ph.D.

4. Title: Cardiovascular aspects of diabets mellitus
5. Title: Left ventricular function of obese patients.
Tutor: Tibor Fülöp M.D., Ph.D.

6. Title: Antithrombotic therapy in patients with ischaemic heart disease.
Tutor: Tibor Szűk M.D., Ph.D.

7. Title: Supraventicular arrhythmias.
Tutor: Csaba Kun M.D.

8. Title: The role of echocardiography in staving off complication of myocardial infarction.
Tutor: Ildikó Farkas-Rácz M.Sc.

9. Title: Stem cell therapy after myocardial infarction.
Tutor: László Balogh M.D.

10. Title: Aspirin - resistency
Tutor: Nóra Homoródi M.D.

11. Title: Cardiovascular complications of dermatomyositis.
Tutor: Andrea Péter M.D.

12. Title: Electrical treatment modalities in heart failure
Tutor: Orsolya Bene M.D.

13. Title: Invasive hemodynamic measurements in heart failure patients
Tutor: László Fülöp M.D., Ph.D.

Department of Botany

1. Title: Stress tolerance and resistance mechanisms of higher plants
Tutor: Ilona Mészáros M.Sc., Ph.D., C.Sc.

2. Title: The study of chromatin and microtubule organization in cells of higher plants
Tutor: Csaba Máthé M.Sc., Ph.D.

3. Title: Plant bioactive compounds
Tutor: Gábor Vasas M.Sc., Ph.D.

4. Title: Role of glycoproteins in infection and immunology (bibliographic)
Tutor: János Kerékgyártó M.Sc., Ph.D., C.Sc.

Division of Clinical Physiology

1. Title: Improvement of myocardial inotropy under physiological and pathological conditions
Tutor: Zoltán Papp M.D., Ph.D., D.Sc.

2. Title: The role of posttranslational modifications in the contractile regulation of the heart.
3. Title: The role of vanilloid receptors in cardiovascular regulatory mechanisms
Tutor: Attila Tóth M.Sc., Ph.D., D.Sc.

4. Title: Endogenous regulation of the renin-angiotensin-aldosterone system and its clinical significance
Tutor: Miklós Fagyas M.D., Ph.D.

Division of Nuclear Medicine and Translational Imaging

1. Title: Development of E-learning material for nuclear medicine
Tutor: József Varga M.Sc., Ph.D.

2. Title: Analysis of metabolic and morphologic pattern of breast cancer in case of the diameters larger then 3 cm
3. Title: The role of Tc99m-Tektrotyd SPECT/CT to evaluate metastatic neuroendocrine tumors
Tutor: Ildikó Garai M.D., Ph.D.

Department of Human Genetics

1. Title: Characterization of factor-C protein family using sequence databases.
2. Title: Expression of WT1 and its splice variants in different diseases studied by real time PCR.
3. Title: Study of a gene regulating differentiation in bacteria.
4. Title: Study of the WT1 gene in urogenital malformations.
Tutor: Sándor Biró M.Sc., Ph.D., D.Sc.

5. Title: Human disease models in animals and lower eukaryotes (review).
Tutor: Zsigmond Fehér M.D., Ph.D.

6. Title: Ca++-binding proteins in Streptomyces
7. Title: Isolation of mono-ADP-ribosylated proteins from pro- and eukaryotic cells.
Tutor: András Penyige M.Sc., Ph.D.

8. Title: Analysis of an A factor non-producer bald mutant Streptomyces griseus strain with respect of antibiotic production and cell differentiation.
Tutor: Zsuzsanna Birkó M.Sc., Ph.D.

9. Title: Chromosome-tracking studies in complex diseases.
Tutor: György Vargha M.D., Ph.D.

10. Title: Factor-C: a protein regulating differentiation in Streptomycetes.
Tutor: Judit Keserű M.Sc., Ph.D.

11. Title: Copy number variation of WT-1 gene in hematological conditions
Tutor: Gergely Buglyó M.D., Ph.D.

12. Title: Functional analysis of the Streptomyces facC gene in Aspergillus
Tutor: Melinda Paholcsek M.Sc., Ph.D.

13. Title: Global analysis of the human blood plasma epitome and interactome in health and disease.
14. Title: Use of comparative monoclonal antibody proteomics to detect three dimensional conservation relevant to protein function.
Tutor: László Takács M.D., Ph.D., D.Sc., M.H.A.Sc.

15. Title: Study of antibiotic production and differentiation in Streptomyces bacteria.
16. Title: Study the role of miRNAs in oncogenic disorders.
Tutor: Melinda Szilágyi-Bónizs M.Sc., Ph.D.

Department of Clinical Oncology

1. Title: Relationship between exercise and development of malignant tumors
2. Title: Role of microRNAs in development of breast cancer
3. Title: Role of optimalisation of body weight in treatment and prevention of malignant tumors
Tutor: Zsolt Horváth M.D., Ph.D.

4. Title: Re-purposing of clinical drugs for cancer prevention
Tutor: Iván Uray M.D., Ph.D.

Department of Immunology

1. Title: Phenotypic and functional properties of dendritic cells
Tutor: Éva Rajnavölgyi M.Sc., Ph.D., D.Sc.

2. Title: Functional properties of SLAM receptor family proteins in dendritic cells
3. Title: The role of the HOFI/SH3PXD2B adaptor protein in the regulation of the tumor microenvironment
Tutor: Árpád Lányi M.Sc., Ph.D.

4. Title: The role of innate immune cells in the development of allergic responses
5. Title: The role of innate lympoid cells (ILC) in human diseases
Tutor: Attila Bácsi M.Sc., Ph.D.

6. Title: Altered differentiation of monocyte derived dendritic cells and their functional differences
Tutor: Péter Gogolák M.Sc., Ph.D.

7. Title: Study of non-apoptotic cytotoxic processes during immune response, new way of killing apoptosis resistant tumor cells
Tutor: Gábor Koncz M.Sc., Ph.D.

Division of Clinical Oncology

1. Title: Current treatment of kidney cancer
Tutor: Balázs Juhász M.D.

2. Title: Palliation in oncology
Tutor: Éva Szekanecz M.D., Ph.D.

3. Title: Epidemiology, prognostic factors and therapeutic options of neuroendocrine tumors

4. Title: Neoadjuvant treatment of breast cancer, as field of research
Tutor: Judit Kocsis M.D., Ph.D.

Department of Laboratory Medicine

1. Title: Investigation of thrombosis and inflammation in PSGL-1 deficiency.
2. Title: The effect of thrombotic and inflammatoric stimuli on platelet activation
Tutor: János Kappelmayer M.D., Ph.D., D.Sc.

3. Title: Functional analysis of antimicrobial fusion proteins
4. Title: Molecular genetic diagnostics of hematological and other malignant diseases
Tutor: Péter Antal-Szalmás M.D., Ph.D.

5. Title: Molecular genetic diagnosis of cystic fibrosis
6. Title: Molecular genetic diagnosis of severe inherited disease
Tutor: István Balogh M.Sc., Ph.D.

7. Title: Analysis of stem cell mobility during pheripherial stem cell transplantation
8. Title: Application of FXIII-A in the detection of minimal residual disease in acute lymphoblastic leukemia
Tutor: Zsuzsa Hevessy M.D., Ph.D.

9. Title: Laboratory diagnostic of osteoporosis
Tutor: Harjit Pal Bhattoa M.D., Ph.D.

10. Title: Applications of calculated GFR
Tutor: Anna Oláh M.Sc., Ph.D.

11. Title: The significance of the laboratory investigation of HE4 in cystic fibrosis
Tutor: Béla Nagy Jr. M.D., Ph.D.

Division of Clinical Laboratory Science

1. Title: Correlation of FXIII levels and FXIII-B subunits polymorphisms with the risk of deep vein thrombosis
2. Title: New chromogenic assay to detect APC resistance
Tutor: László Muszbek M.D., Ph.D., D.Sc., M.H.A.Sc.
3. Title: Effect of alfa2-plasmin inhibitor polymorphisms on the risk of thrombosis
4. Title: Effect of FXIII on smooth muscle cell functions
5. Title: Investigation of alfa2-plasmin inhibitor and fibrinogen interaction
6. Title: Method development for the detection of various alpha2 plasmin inhibitor isoforms
Tutor: Éva Katona M.Sc.

7. Title: Inherited hemostasis disorders; laboratory and molecular genetic aspects
8. Title: Laboratory monitoring of the new generation oral anticoagulants
9. Title: New diagnostic methods in Protein S deficiency.
Tutor: Zsuzsanna Bereczky M.D., Dr. habil., Ph.D.

10. Title: Characterization oh the heparin-antithrombin interaction with surface plasmon resonance
11. Title: Coagulation factor and inhibitor levels in end-stage renal disease
12. Title: The interactions of blood coagulation factor XIII B subunit with different proteins
Tutor: Krisztina Pénzes-Daku M.Sc., Ph.D.

13. Title: Hybrid quantum mechanics - molecular mechanics (QM/MM) calculations on biological systems
Tutor: István Komáromi M.Sc., Ph.D.

14. Title: Fibrinolytic marker levels and polymorphisms in ischemic stroke patients
15. Title: Local hemostasis alterations in the left atrium of patients with atrial fibrillation
Tutor: Zsuzsa Bagoly M.D., Ph.D.

Division of Radiotherapy

1. Title: Dealing with irradiation induced side effects
2. Title: Neoadjuvant radio-chemotherapy of rectal cancer
3. Title: Palliative and supportive care in radiooncology
4. Title: Partial irradiation of the breast

5. Title: Radiotherapy of breast cancer
Tutor: Andrea Furka M.D., Ph.D.

Department of Dermatology

1. Title: Ablative laser treatment in Hailey-Hailey disease
2. Title: DNA repair mechanisms
3. Title: Genetic susceptibility in psoriasis
4. Title: Laser therapy of vascular skin lesions
5. Title: Lipid metabolism in psoriasis
Tutor: Éva Remenyik M.D., Ph.D., D.Sc.

6. Title: Importance of sentinel node dissection in the complex therapy of melanoma
7. Title: Modern moist wound dressings with simultaneous effective antibacterial properties in the treatment of difficult to heal wounds
8. Title: Options for treatment of basal cell cancer including targeted therapy
9. Title: Possibilities of biotechnological skin substitution in the treatment of burns
10. Title: Possibilities of cell therapy in the treatment of burns
11. Title: Possibilities of scar correction
12. Title: Role of Negative Pressure Therapy in burn treatment
Tutor: István Juhász M.D., Ph.D., C.Sc.

13. Title: Deformities and discolorations of the nails: relation to other medical conditions. Overview of the literature and case reports.
Tutor: Éva Szabó M.D., Ph.D.

14. Title: Significance of compression therapy in treating venouos leg ulcer
Tutor: Zoltán Péter M.D.

15. Title: Biological therapy in psoriasis - mechanism of action and reasons for secunder loss of response
16. Title: New approaches in the classification and therapy of chronic urticaria
17. Title: Possibility of allergen specific immuntherapy in the treatment of atopic dermatitis
Tutor: Krisztián Gáspár M.D., Ph.D.

18. Title: Lipid disorder associated dermatological symptoms
19. Title: Role of lipid environment in the activation of dermal macrophages
Tutor: Dániel Törőcsik M.D., Ph.D.

20. Title: New therapies in severe psoriasis vulgaris
21. Title: Opalizumab therapy in chronic urticaria
Tutor: Andrea Szegedi M.D., Ph.D., D.Sc.

Department of Medical Chemistry

1. Title: Investigation of Ser/Thr protein phosphatase in pathogenic fungi
Tutor: Viktor Dombrádi M.Sc., Ph.D., D.Sc.

2. Title: Interaction of protein phosphatase 1 catalytic subunit with regulatory proteins
Tutor: Ferenc Erdődi M.Sc., Ph.D., D.Sc.

3. Title: Mechanism of oxidative stress-induced cell death
4. Title: Mesenchymal stem cell differentiation
5. Title: Regulation of macrophage activation and pyroptotic death
Tutor: László Virág M.D., Ph.D., D.Sc.

6. Title: Scaffolding proteins in the endothelium
Tutor: Csilla Csortos M.Sc., Ph.D.

7. Title: Structural and functional investigation of a fungus specific protein phosphatase
Tutor: Ilona Farkas M.Sc., Ph.D.

8. Title: Study of metabolic processes with special regard to the involvement of mitochondrial activity.
Tutor: Péter Bay M.Sc., Ph.D.

9. Title: Identification of adenosine receptor 2A interacting proteins in macrophages
Tutor: Endre Kókai M.Sc., Ph.D.

10. Title: Study of the role of protein phosphatase in wound healing
Tutor: Beáta Lontay M.Sc., Ph.D.

11. Title: Regulation of protein phosphatase-1 by inhibitory proteins and the translation of the targing subunit
Tutor: Andrea Kiss M.Sc., Ph.D.

12. Title: High-Throughput Screening
Tutor: Csaba Hegedűs M.Sc., Ph.D.

Department of Medical Microbiology

1. Title: Antimicrobial cell-mediated immunity measured by mRNA tests
Tutor: József Kónya M.D., Ph.D.

2. Title: Evaluation of in vitro efficacy of different new antibiotics against multiresistant bacteria
Tutor: Judit Szabó M.D., Ph.D.

3. Title: Role of HPV in head and neck cancers
Tutor: Krisztina Szarka M.Sc., Ph.D.

4. Title: Evaluation of fungicidal effect of antifungal agents using time-kill curves
5. Title: New and older agents in antifungal chemotherapy
Tutor: László Majoros M.D., Ph.D.

6. Title: Prevalance of human polyomaviruses
Tutor: Eszter Csoma M.Sc., Ph.D.

7. Title: Effects of human papillomavirus oncoproteins on cellular signaling pathways in keratinocytes
Tutor: Anita Szalmás M.Sc., Ph.D.

8. Title: Molecular epidemiology of aminoglycoside resistance in nosocomial Gram negative bacteria
Tutor: Gábor Kardos M.D., Ph.D.

9. Title: Intratypical variation of human papillomaviruses
Tutor: György Veress M.Sc., Ph.D.

10. Title: The importance of fungal quorum-sensing in antifungal therapy against Candida biofilms.
Tutor: Renátó Kovács M.Sc., Ph.D.

Department of Internal Medicine

1. Title: Immunotherapy of B cell lymphomas.
2. Title: Safety profile of prolonged rituximab therapy in lymphomas.
3. Title: Targeted therapy in non-Hodgkin's lymphomas
Tutor: Lajos Gergely M.D., Ph.D., D.Sc.

4. Title: Clinical testing of sinus node function.
Tutor: Péter Kovács M.D., DLA, Ph.D., D.Sc.

5. Title: Lipid abnormalities in hypothyreoidism.
6. Title: The function of LDL in lipid metabolism
Tutor: György Paragh M.D., Ph.D., D.Sc.

7. Title: Diagnostic tests and imaging techniques in endocrinology.
Tutor: Endre Nagy M.D., Ph.D., D.Sc.

8. Title: Antiarrhythmic drug treatment.
9. Title: Cardiac arrhythmias in patients end-stage renal failure.
10. Title: Pacemaker treatment and myocardial infarction.
11. Title: Pathophysiology of neurocardiogenic syncope.
12. Title: Rhythm disturbances and the autonomic system of the heart.
13. Title: Ventricular repolarization and drugs.
Tutor: István Lőrincz M.D., Ph.D.

14. Title: Investigations of lipoproteins in normo- and hypercholesterinemic patients.
Tutor: Judit Boda M.D.

15. Title: Adipokines and Insulin Resistance
16. Title: Obesity: Diagnosis and Treatment
17. Title: Obesity: Etiology and Co-morbidities
Tutor: Péter Fülöp M.D., Ph.D.

18. Title: Characteristics of rare systemic vasculitides
19. Title: Sjögren's syndrome associated with other autoimmune disease
Tutor: Margit Zeher M.D., Ph.D., D.Sc.

20. Title: Immunoregulatory abnormality in undifferentiated connective tissue disease

21. Title: Interstitial lung diseases in MCTD.
22. Title: The presence of antiphospholipide antibodies in the disease course of the MCTD
23. Title: Vascular involvement in mixed connective tissue disease.
24. Title: Vascular risk factors in undifferentiated connective tissue disease
Tutor: Edit Bodolay M.D., Ph.D., D.Sc.

25. Title: Dermato/polymyositis overlap with antiphospolipide syndrome.
26. Title: Genetical study in myositis
27. Title: Improvement of quality of life in polymyositis and dermatomyositis patients by physiotherapy
Tutor: Katalin Dankó M.D.,Ph.D.,D.Sc.

28. Title: Plasmapheresis treatment in intensive therapy
Tutor: Pál Soltész M.D., Ph.D., D.Sc.

29. Title: Autoimmune disorders and GI tract
Tutor: Zsolt Barta M.D., Ph.D.

30. Title: Ischemic colitis.
31. Title: Life quality of Raynaud syndrome
Tutor: Zoltán Csiki M.D., Ph.D.

32. Title: The disease course after stent inplantation in peripheral arterial disease
Tutor: György Kerekes M.D., Ph.D.

33. Title: Novel therapeutical approaches in multiple myeloma
34. Title: The impact of multi-drug resistance genes in the prognosis of lymphoproliferative disorders
Tutor: László Váróczy M.D., Ph.D.

35. Title: Inherited and acquired thrombophilia
36. Title: New direct oral anticoagulants
37. Title: Stem cell therapy in peripheral arterial disorders
Tutor: Zoltán Boda M.D., Ph.D., D.Sc.

38. Title: Gastric cancer: clinics and treatment
39. Title: Gastrointestinal bleeding
40. Title: Gluten sensitive enteropathy
41. Title: Inflammatory bowel diseases.
42. Title: Lymphomas in the gastrointestinal tract.
Tutor: István Altorjay M.D.,Ph.D.

43. Title: Langerhans histiocytosis
44. Title: Osteosclerotic myeloma
45. Title: Therapeutic challenges in rare haemostatic disorders
Tutor: György Pfliegler M.D., Ph.D.

46. Title: Epidemiology, diagnostics and therapy of chronic hepatitis C
47. Title: Pathomechanism of alcoholic hepatitis
48. Title: Signs, diagnostics and treatment of portal hypertension.
49. Title: Therapeutic options in primary sclerotizing cholangitis
50. Title: Treatment of autoimmune hepatitis
Tutor: István Tornai M.D., Ph.D.

51. Title: A case history of an interesting acute myeloid leukaemia patient in the 2nd Department of Medicine (connection with the literature data)
Tutor: Attila Kiss M.D., Ph.D.

52. Title: Chronic neutrophilic leukaemia
Tutor: Béla Telek M.D., Ph.D.

53. Title: Therapeutic options of CML
Tutor: László Rejtő M.D., Ph.D.

54. Title: Biological treatment of ulcerative colitis
Tutor: Károly Palatka M.D., Ph.D.

55. Title: The role of Willebrand factor in various internal diseases.
Tutor: Ágota Schlammadinger M.D., Ph.D.

56. Title: Bacterial infection in liver cirrhosis
57. Title: Current therapeutic options of acute pancreatitis
Tutor: Zsuzsa Vitális M.D., Ph.D.

58. Title: Diagnosis and treatment of chronic lymphocytic leukemia
59. Title: Novel therapeutic approches in the treatment of multiple myeloma
60. Title: Philadelphia negative chronic

myeloproliferative neoplasms - novel genetic and therapeutic improvements
61. Title: Recent advances in the management of chronic ITP
Tutor: Péter Batár M.D., Ph.D.

62. Title: Heparin-induced thrombocytopenia
Tutor: Zsolt Oláh M.D., Ph.D.

63. Title: Are the bacterial infections predictable in liver cirrhosis?
64. Title: Role of serological markers in prediction of disease course and response to therapy in inflammatory bowel diseases.
Tutor: Mária Papp M.D., Ph.D.

Department of Pathology

1. Title: Molecular classification of glial neoplasms
2. Title: Overview of non-adenohypophysaer neoplastic lesion within and around the sella
3. Title: Use of IDH-1 immunohistochemistry in surgical neuropathology
Tutor: Péter Molnár M.D., D.Sc.

4. Title: Functional analysis of malignant lymphomas using image analysis
5. Title: Mitotic failures and cancer progression
6. Title: Molecular diagnostics of solid tumors
Tutor: Gábor Méhes M.D., D.Sc.

7. Title: Clinicopathological studies in haemorrhagic stroke
8. Title: Clinicopathological studies in ischaemic stroke
9. Title: Dementia with Lewy bodies (DLB) and Parkinson’s disease dementia (PDD)–differences and similarities
10. Title: Molecular pathology of glial brain tumours
11. Title: Pathomechanisms of cell death in neurodegenerative diseases
Tutor: Tibor Hortobágyi M.D., Ph.D.

Department of Pharmacology and Pharmacotherapy

1. Title: Cardiovascular risk factors
2. Title: Metabolic link between obesity and insulin resistance
Tutor: Zoltán Szilvássy M.D., Ph.D., D.Sc.

3. Title: Arrhythmic patient in dentistry
4. Title: Optional title in pharmacology
5. Title: Pharmacological and clinical significance of adenosine receptor antagonists
6. Title: Pharmacological and non-pharmacological treatment of endothelial dysfunction
7. Title: Pharmacology of antidepressive drugs: dental implications
Tutor: József Szentmiklósi M.D., Ph.D.

8. Title: Emerging roles of prostaglandin DP1 and DP2 receptors in acute and chronic aspects of allergic diseases
9. Title: Optional title in pharmacology
10. Title: Pharmacological treatment of acute decompensated heart failure (ADHF)
11. Title: Pharmacology of herbal remedies
12. Title: Pharmacology of neurogenic inflammation
13. Title: Pharmacotherapy of Amyotrophic Lateral Sclerosis (ALS)
14. Title: Pharmacotherapy of Duchenne Muscular Dystrophy (DMD)
15. Title: Possible pharmacological exploitations of TRPV1 receptors
16. Title: Use of Histone deacetylase inhibitors (HDI): Novel advances in cancer treatment
Tutor: Róbert Pórszász M.D., Dr. habil., MBA, Ph.D.

17. Title: Effect of colony stimulating factors or other drugs on bone marrow-derived cell lines
18. Title: How insulin resistance influences drug effects
19. Title: Selected topic in field experimental hemato-oncology
Tutor: Ilona Benkő M.D., Ph.D.

20. Title: Optional title on cancer chemotherapy
Tutor: Attila Megyeri M.D., Ph.D.

21. Title: Optional title in pharmacology
Tutor: Ágnes Cseppentő M.D.

22. Title: Optional title on antibacterial chemotherapy
Tutor: Zsuzsanna Gál M.Sc., Ph.D.

23. Title: Optional title in pharmacology
Tutor: Béla Juhász D.Pharm., Dr. habil., Ph.D.

24. Title: Optional title in pharmacology
Tutor: Balázs Varga D.Pharm., Ph.D.

25. Title: Optional title in pharmacology
Tutor: Mariann Bombicz D.Pharm.

26. Title: Optional title in pharmacology
Tutor: Dániel Priksz D.Pharm.

Department of Physiology

1. Title: Expression and significance of the TASK channels in physiological and pathological conditions
Tutor: Péter Szűcs M.D., Ph.D.

2. Title: Alterations of intracellular calcium concentration in pathological conditions
Tutor: László Csernoch M.Sc., Ph.D., D.Sc.

3. Title: Regional differences in the electrophysiological properties of cardiomyocytes
Tutor: Péter Nánási M.D., Ph.D., D.Sc.

4. Title: Role of afterdepolarization mechanisms in the arrhythmogenesis
Tutor: Tamás Bányász M.D., Ph.D.

5. Title: Electrophysiological properties of mammalian cardiac tissues
Tutor: János Magyar M.D., Ph.D., D.Sc.

6. Title: Beat-to beat variability of cardiac repolarization
Tutor: Norbert Szentandrássy M.D., Ph.D.

7. Title: Studies on ion channels incorporated into artificial membranes
Tutor: István Jóna M.Sc., Ph.D., D.Sc.

8. Title: Role of late sodium current in the arrhythmogenesis
Tutor: Balázs Horváth M.D., Ph.D.

9. Title: Role of potassium channels in neuron function
Tutor: Balázs Pál M.D., Ph.D.

10. Title: Properties of vanilloid receptors
Tutor: István Balázs Tóth M.Sc., Ph.D.

11. Title: Role of Protein Kinase C isoforms in cell function.
Tutor: Gabriella Czifra M.Sc., Ph.D.

Division of Gastroenterology

1. Title: Gastric cancer: clinics and treatment
2. Title: Gastrointestinal bleeding
3. Title: Gluten sensitive enteropathy
4. Title: Inflammatory bowel diseases
5. Title: Lymphomas in the gastrointestinal tract
Tutor: István Altorjay M.D., Ph.D.

6. Title: Epidemiology, diagnostics and therapy of chronic hepatitis C
7. Title: Pathomechanism of alcoholic hepatitis
8. Title: Signs, diagnostics and treatment of portal hypertension
9. Title: Therapeutic options in primary sclerotizing cholangitis
10. Title: Treatment of autoimmune hepatitis
Tutor: István Tornai M.D., Ph.D.

11. Title: Biological treatment of ulcerative cholitis
Tutor: Károly Palatka M.D., Ph.D.

12. Title: Are the bacterial infections predictable in liver cirrhosis?
13. Title: Role of the serological markers in prediction of disease course and response to therapy in inflammatory bowel diseases
Tutor: Mária Papp M.D., Ph.D.

14. Title: Bacterial infection in liver cirrhosis
15. Title: Current therapeutic options of acute pancreatitis
Tutor: Zsuzsanna Vitális M.D., Ph.D.

Division of Haematology

1. Title: Immuno-chemotherapy in B-cell non-Hodgkin lymphomas
2. Title: Infections during aggressive therapies in lymphoma patients
3. Title: New monoclonal antibody based therapeutic approaches in the treatment of hematologic malignancies.
4. Title: Next generation sequencing and identification of mutations in lymphomas. New targets in therapy.
5. Title: The role of miRNA in the pathogenesis of lymphomas, possible targets for therapy
6. Title: Vaccination based therapies in lymphomas

Tutor: Lajos Gergely M.D., Ph.D., D.Sc.

7. Title: Examination of polyneuropathy in multiple myeloma patients treated with bortezomib
8. Title: New treatment approaches in multiple myeloma
9. Title: The role of autologous stem cell transplantation in the treatment of autoimmune disorders
10. Title: Treatment results in our multiple myeloma patients

Tutor: László Váróczy M.D., Ph.D.

11. Title: Therapeutic options of CML

Tutor: László Rejtő M.D., Ph.D.

12. Title: Diagnosis and treatment of chronic lymphocytic leukemia
13. Title: Novel therapeutic approaches in the treatment of multiple myeloma
14. Title: Philadelphia negative myeloproliferative meoplasms - novel genetic and therapeutic improvements
15. Title: Recent advances in the management of chronic ITP

Tutor: Péter Batár M.D., Ph.D.

Division of Rare Diseases

1. Title: Langerhans histiocytosis
2. Title: Osteosclerotic myeloma
3. Title: Therapeutic challenges in rare haemostatic disorders

Tutor: György Pfliegler M.D., Ph.D.

Division of Rheumatology

1. Title: Cardiopulmonary manifestation in systemic sclerosis
2. Title: Pulmonary arterial hypertension in systemic sclerosis.

Tutor: Gabriella Szűcs M.D., Ph.D.

3. Title: Rheumatology 2015 - modern diagnostics and therapy.

Tutor: Zoltán Szekanecz M.D., Ph.D., D.Sc.

4. Title: Quality of life in systemic sclerosis

Tutor: Szilvia Szamosi M.D., Ph.D.

5. Title: Diagnosis and therapy of early arthritis
6. Title: Modern therapy of vasculitides

Tutor: Edit Végh M.D.

7. Title: Extra-articular manifestations of ankylosing spondylitis
8. Title: Modern treatment of spondyloarthritides

Tutor: Sándor Szántó M.D., Ph.D.

9. Title: Efficacy of long-term therapy with biological agents in rheumatoid arthritis.

Tutor: Ágnes Horváth M.D.

Department of Neurology

1. Title: Cerebral hemodynamics and cognitive dysfunction in treated and non-treated stroke patients
2. Title: Neurosonological investigations in acute and chronic stroke patients
3. Title: Non-invasive investigation of endothelial dysfunction.

Tutor: László Csiba M.D., Ph.D., D.Sc.

4. Title: Comorbidity in Multiple sclerosis

Tutor: Tünde Csépány M.D., Ph.D.

5. Title: Effect collateral circulation from the external carotid artery in patients with unilateral internal carotid artery occlusion.

6. Title: Effect of actual blood pressure on the cerebrovascular reactivity.
Tutor: László Oláh M.D., Ph.D.

7. Title: Cardiovascular risk in sleep apnea.
8. Title: Hypoxic stress and its consequenses in sleep apnea.
9. Title: Obesity and sleep apnea.
Tutor: Tünde Magyar M.D., Ph.D.

Department of Neurosurgery

1. Title: Comparison of cerebral vasopasm following endovascular or surgical treatment of aneurysmal rupture
2. Title: Do middle cerebral artery aneurysms exhibit right sided dominance?
3. Title: Treatment of multiple cerebral metastases: clinical results
Tutor: Sándor Szabó M.D., Ph.D.

4. Title: Current treatment of multiloculated hydrocephalus.
5. Title: Surgical treatment of lesional epilepsy
Tutor: László Novák M.D., Ph.D.

6. Title: Connection of proteoglycans and cell membrane receptors in the peritumoral extracellular matrix
Tutor: Álmos Klekner M.D., Ph.D.

7. Title: History of neurosurgical radiosurgery.
Tutor: József Dobai M.D.

8. Title: Vertebroplasty.
Tutor: Péter Ruszthi M.D.

Department of Obstetrics and Gynecology

1. Title: Clinical trials of new drugs for the treatment of osteoporosis
Tutor: Ádám Balogh M.D., Ph.D., D.Sc.

2. Title: Diagnosis and Treatment of Endometrial Cancer
3. Title: Diagnosis and Treatment of Ovarian Cancer
4. Title: Diagnosis and Treatment of Vulvar Cancer
5. Title: Screening /Diagnosis and Treatment of Cervical Cancer
Tutor: Zoltán Hernádi M.D., Ph.D., D.Sc.

6. Title: Labour induction
Tutor: Tamás Major M.D., Ph.D.

7. Title: Non-invasive prenatal testing for chromosomal aneuploidies
Tutor: Olga Török M.D., Ph.D.

8. Title: Efficiency and safety of first line chemotherapy in ovarian cancer
9. Title: Efficiency and safety of second and subsequent line chemotherapy in ovarian cancer
10. Title: Efficiency of HPV vaccination
11. Title: Fetal assessment by biophysical profile
12. Title: Marker studies in ovarian cancer
13. Title: Molecular medicine and ovarian cancer
14. Title: Molecular medicine and prenatal diagnosis
15. Title: Neoadjuvant chemotherapy of cervical cancer
16. Title: Placental atherogenesis
17. Title: Surgical treatment of recurrent ovarian cancer
18. Title: Surgical treatment of vulval cancer
19. Title: The role of inherited and acquired thrombophilia in reproductive health
20. Title: The role of lymphadenectomy in the treatment of endometrial cancer
21. Title: The role of preoperative MRI in cervical cancer
22. Title: Trends in operative delivery
Tutor: Róbert Póka M.D., Dr. habil., Ph.D.

23. Title: Acceptance of invasive prenatal diagnostic tests
24. Title: Meiotic abnormalities and their clinical significance in human reproduction
25. Title: Role of Doppler ultrasound in antenatal care
Tutor: Tamás Szilveszter Kovács M.D., Ph.D.

26. Title: Anovulatory infertility
27. Title: Examination of genetic concerns about the safety of assisted reproduction

28. Title: Role of antimullerian hormone (AMH) in clinical practice
29. Title: Ultrasound dating in pregnancy
Tutor: Attila Jakab M.D., Ph.D.

30. Title: Vaginal Birth After Cesarean
Tutor: Alpár Gábor Juhász M.D., Ph.D.

31. Title: Cervical cancer prevention: the role and the future of HPV vaccination besides conventional screening
32. Title: New treatment strategies in ovarian cancer
Tutor: Zoárd Krasznai M.D., Ph.D.

33. Title: Role of endoscopy in infertility work-up
Tutor: Péter Török M.D., Ph.D.

34. Title: Pregnancy care in PCOS patients
35. Title: Special aspects of pregnancy care in patients with endocrine disorders
36. Title: Thyroid autoimmunity - clinical significance, prevention and treatment in human reproduction
Tutor: Tamás Deli M.D., Ph.D.

37. Title: Transvaginal hydrolaparoscopy - a new method
38. Title: Hysteroscopic treatment of different gynecologic pathologies
39. Title: White blood cell function in preeclampsia
Tutor: Rudolf Lampé M.D., Ph.D.

40. Title: Contraception in the 21st century
Tutor: Balázs Erdődi M.D.

Division of Gynecological Oncology

1. Title: Chemotherapy of ovarian cancer
2. Title: Prognostic relevance of HPV-infection in cervical cancer
3. Title: Surgical treatment of HPV-infection
4. Title: The prognostic role of CA-125 in ovarian cancer
Tutor: Zoltán Hernádi M.D., Ph.D., D.Sc.

5. Title: Chemotherapy of cervical cancer
6. Title: Epidemiology and therapy of vulvar cancer
7. Title: Epidemiology of metastatic ovarian cancer
8. Title: Follow-up of endometrial cancer patients, analysis of prognostic factors
9. Title: Prothrombotic states in gynaecologic cancer
10. Title: Superoxid anion production of granulocytes in gynecologic cancer
Tutor: Róbert Póka M.D., Dr. habil., Ph.D.

11. Title: Prognostic factors and treatment of cervical cancer
12. Title: The role of CA125 and HE4 in the follow-up of ovarian cancer
Tutor: Zoárd Krasznai M.D., Ph.D.

Department of Ophthalmology

1. Title: Biomechanics of different corneal diseases
2. Title: Corneal tomography in the diagnosis of keratoconus
3. Title: Diagnosis and treatment of dry eye
4. Title: Lamellar and penetrating keratoplasty techniques
Tutor: László Módis M.D., Ph.D., D.Sc.

5. Title: Intraocular tumors
Tutor: Judit Damjanovich M.D., Ph.D.

6. Title: Ocular clinical signs in rare diseases
Tutor: Valéria Nagy M.D., Ph.D.

7. Title: Corneal dystrophies
8. Title: Stem cells of the cornea
Tutor: Lili Takács M.D., Ph.D.

9. Title: Nuclear medicine measurements in the inflammatory disorders of the eye’s anterior segment
10. Title: Prospective study of vascular pathogenesis of eye diseases associated to rheumatologic and immunologic disorders
11. Title: Tear citokine measurements in inflammatory diseases of the anterior segment of the eye associated to immunological and autoimmunological disorders

12. Title: Tear-clearance measurements in dry eye syndrome with dacryoscintigraphy
Tutor: Ádám Kemény-Beke M.D., Ph.D.

13. Title: Contact lens wear and complications
14. Title: Cosmetical contact lenses
Tutor: Beáta Kettesy M.D., Ph.D.

15. Title: Importance of screening in diabetic retinopathy
16. Title: Morfologic changes in glaucoma
Tutor: Adrienne Csutak M.D., Ph.D.

17. Title: Corneal measurments with Pentacam
18. Title: Refractive laser-surgical interventions
Tutor: Bence Lajos Kolozsvári M.D., Ph.D.

19. Title: Examination of peptide receptors in human uveal melanoma
20. Title: Results of orbital decompression surgeries
21. Title: VEGF level in tears after PKP
Tutor: Zita Steiber M.D., Ph.D.

22. Title: Color Doppler in the follow-up of choroidal melanoma after brachytherapy
23. Title: Subtenon TCA in the treatment of radiogen retinopathy
Tutor: Éva Surányi M.D.

24. Title: Molecular genetic analysis of ocular fundus disorders
25. Title: Novel methods for periosteal fixation in ophthalmic plastic surgery
Tutor: Gergely Losonczy M.D., Ph.D.

26. Title: Graves' orbitopathy - current concepts in diagnosis and therapy
27. Title: Pathogenesis of Graves' orbitopathy
Tutor: Bernadett Ujhelyi M.D., Ph.D.

28. Title: Assessing the safety and efficacy of intravitreal ranibizumab as a preoperative adjunct treatment before vitrectomy surgery in severe proliferative diabetic retinopathy (PDR) compared to standard vitrectomy alone
29. Title: Evaluate and demonstrate the results of the Hungarian Lucentis National Patient Registry
Tutor: Attila Vajas M.D.

30. Title: Congenital ptosis peculiar associated movements of the affected lid
31. Title: Diagnosis and therapy in retinopathy of prematurity
32. Title: Non - surgical and surgical therapy of congenital ptosis
Tutor: Annamária Nagy M.D.

33. Title: Ocular manifestations of Weill-Marchesani syndrome
34. Title: Pellucid marginal degeneration
Tutor: Mariann Fodor M.D., Ph.D.

35. Title: BCVA change after intravitreal ranibizumab injection
36. Title: IOP change after intravitreal ranibizumab injection
Tutor: Erika Papp M.D.

Department of Orthopedic Surgery

1. Title: The role of arthrodesis in the treatment of degenerative arthritis of the knee.
2. Title: Treatment options in knee instability.
Tutor: Henrik Rybaltovszki M.D.

Department of Pediatrics

1. Title: Contemporary evalutation and treatment of medulloblastoma
2. Title: Thalassemia minor in North-East Hungary
Tutor: Csongor Kiss M.D., Ph.D., D.Sc.

3. Title: Beta-blocker therapy for preventing and treating cyanotic spells in pre-operative patients with tetralogy of Fallot
Tutor: Gábor Mogyorósy M.D., Ph.D.

4. Title: Hydrocephaly of infants
Tutor: Andrea Nagy M.D.

5. Title: IgA nephropathy in childhood
Tutor: Tamás Szabó M.D., Ph.D.

6. Title: Fungal infections in malignant hematology
Tutor: István Szegedi M.D., Ph.D.

7. Title: Experience with tissue adhesives in lip cleft surgery
Tutor: Ágnes Magyar M.D.

8. Title: Aldosteron producing suprarenal tumors in children
9. Title: Efficiency of Nordic Walking therapy in case of obese children regarding motivation for slimming
10. Title: Physiotherapy of diabetic children - prevention of hypoglycemia
Tutor: Enikő Felszeghy M.D., Ph.D.

Department of Physical Medicine and Rehabilitation

1. Title: The importance of multidisciplinary rehabilitation to improve functional capacity, quality of life, cardiovascular function and metabolic parameters of obese patients, those suffering from osteoarthritis.
2. Title: The significance of conductive rehabilitation activities in gait development (gait analysis test)
3. Title: The significance of the (upper extremity) functional capacity of patients with cerebrovascular diseases in the effectiveness of rehabilitation
Tutor: Zoltán Jenei M.D., Ph.D.

4. Title: Assessment of quality of life of people with disabilities or with the risk of disability
5. Title: Goal Attainment Scaling in rehabilitation medicine
6. Title: Treatment of spasticity in children with cerebral palsy
Tutor: Zsuzsanna Vekerdy-Nagy M.D., Ph.D. habil.

Department of Psychiatry

1. Title: Effectiveness of schema therapy in personality disorders
2. Title: Emotion dependent and independent cognitive functions in unipolar depression
3. Title: Significance of disfunctional attitudes in depression and anxiety disorders
4. Title: Theory of mind and mentalization deficits in patients with personality disorders
Tutor: Anikó Égerházi M.D., Ph.D.

5. Title: Brain imaging in psychiatry.
6. Title: Oxidativ stress and chronic inflamation in psychiatric disorders
7. Title: Post-traumatic stress disorder and post-traumatic growth.
8. Title: The neurobiology of depression.
9. Title: The role of mikrobiota in mental health
10. Title: The therapeutic potentials of psychodelics
Tutor: Ede Frecska M.D., M.A., Ph.D.

Department of Pulmonology

1. Title: New perspectives in the treatment of lung cancer.
Tutor: Andrea Fodor M.D.

2. Title: New perspectives in the treatment of community acqiured pneumonia
Tutor: László Brugós M.D., Ph.D.

3. Title: The role of extracellular matrix in growing propagation and metastatization of lung cancer
Tutor: Imre Varga M.D., Ph.D.

4. Title: Modern Therapy of NSCLC
Tutor: Tamás Kardos M.D.

Department of Surgery

1. Title: Surgical treatment of Graves disease with ophthalmopathy
Tutor: Ferenc Győry M.D., Ph.D.

2. Title: Surgical treatment of bowel obstruction in colorectal diseases
Tutor: László Damjanovich M.D., Ph.D.

3. Title: Surgical and endovascular interventions in critical limb ischemia
Tutor: Sándor Olvasztó M.D.

4. Title: Histopathologic examination of the carotid plaques regarding their possible prognostic value
Tutor: Krisztina Litauszky M.D.

5. Title: Liver resections for metastases of colorectal cancer
Tutor: János Pósán M.D.

6. Title: Prevention of bronchial stump insufficiency after lung resections
Tutor: István Takács M.D.,Ph.D.

7. Title: The surgical treatment of hyper-parathyroidism
Tutor: Roland Fedor M.D., Ph.D.

8. Title: Different forms of hereditary colorectal cancer among our patients.
Tutor: Miklós Tanyi M.D., Ph.D.

9. Title: Mesh implantation in the surgical treatment of thoracic defects
Tutor: Attila Enyedi M.D.

10. Title: Assessment of the results of hybrid operations during pelveo-femoral vascular reconstruction.
11. Title: Assessment of tumor regression after neoadjuvant chemo-irradiation in distal rectal cancer.
Tutor: Gábor Martis M.D.

Division of Operative Techniques and Surgical Research

1. Title: Anesthesia in experimental animals (for Medicine and Pharmacy students)
Tutor: Ádám Deák D.V.M., Ph.D.

2. Title: New technical possibilities in surgery (for Medicine students)
Tutor: Andrea Furka M.D., Ph.D.

3. Title: Famous surgeons and famous discoveries (for Medicine students)
Tutor: Irén Mikó M.D., Ph.D., C.Sc.

4. Title: Changes of red blood cell mechanical stability in surgical pathophysiological processes (for Medicine and Dentistry students)

5. Title: Investigation of hemorheological and microcirculatory changes in ischemia-reperfusion, including therapeutical possibilities (for Medicine students)
Tutor: Norbert Németh M.D., MBA, Ph.D.

6. Title: Hemostatic agents (bioplasts) in surgery (for Pharmacy students)
7. Title: Ischemia-reperfusion injury and its prevention with different methods (for Medicine and Dentistry students)
Tutor: Katalin Pető M.D., Ph.D.

8. Title: Instruments and devices used in pharmacological care (for Pharmacy students)
Tutor: Tamás Lesznyák M.D., D.Pharm.

9. Title: Chapters from the history of surgical asepsis, antisepsis (for Medicine and Dentistry students)
Tutor: Irén Mikó M.D., Ph.D.

10. Title: Technical development of laparoscopic surgery
Tutor: Zsuzsanna Sarolta Magyar M.D.

Department of Urology

1. Title: Role of laparoscopy in urology
Tutor: Tibor Flaskó M.D., Ph.D.

2. Title: Assessment of urinary incontinence
Tutor: László Lőrincz M.D.

3. Title: Different topics regarding prostate and kidney cancer
Tutor: Csaba Berczi M.D., Ph.D.

4. Title: Bladder replacement after radical cystectomy
Tutor: Antal Farkas M.D., Ph.D.

5. Title: Different topics regarding andrology
Tutor: Mátyás Benyó M.D., Ph.D.

6. Title: Pathology of clear cell renal cancer
Tutor: Krisztián Szegedi M.D.

7. Title: Treatment of urethral structure
Tutor: Mihály Murányi M.D.

8. Title: Assessment of chronic LUTS
Tutor: Sándor Árpád Tóth M.D.

9. Title: Assessment of ejaculatory disturbances
Tutor: József Zoltán Kiss M.D.

10. Title: Effect of ochidopexy on male fertility
Tutor: Gyula Drabik M.D.

Department of Pharmacology

1. Title: Pharmacological and non-pharmacological methods of analgesia in dentistry
2. Title: Pharmacology of articaine
3. Title: Pharmacology of paracetamol and its use in dentistry
Tutor: Ágnes Cseppentő M.D.

4. Title: Optional title in cardiovascular pharmacology.
Tutor: Árpád Tósaki D.Pharm., Ph.D., D.Sc.

Department of Pharmaceutical Technology

1. Title: Nanoparticles and their potential for application in bone.
2. Title: The connection between the regulation of the endocrine and the immune system.
Tutor: Miklós Vecsernyés D.Pharm., Ph.D.

3. Title: Cosmetical treatment of womens with modern micro/and nanoparticles
4. Title: Labels in the pharmacy
5. Title: Medical Plants of the Bible (medical plants in the Old and New Testament)
6. Title: Modern drug delivery systems
7. Title: Pharmaceutical care in Turkey
8. Title: Role of Religious texts in healing
9. Title: Selected chapters of pharmaceutical care I.
10. Title: Selected chapters of pharmaceutical care II.
11. Title: Self-medication in a selected country
12. Title: Significance of the Old Egyptian mumification, potential role in the therapy
13. Title: The Oriental medicines for the world yesterday and today
Tutor: Ildikó Bácskay D.Pharm., Ph.D.

14. Title: Polymeric nanoparticles, methods of preparation and their use in therapy
15. Title: The use of Carbopols in the formulation of different dosage forms.
16. Title: The use of sucrose esters in the formulation of different pharmaceutical dosage forms.
Tutor: Pálma Fehér D.Pharm.

17. Title: Application and production of directly compressible medicated chewing gum
18. Title: Medical, economical and social risk of counterfeit drugs
19. Title: Opportunities for the identification of pharmaceutical products
20. Title: Pharmaceutical Technology aspects of wound healing therapy
21. Title: Side effects of preservatives on ocular surface
22. Title: Stability problem of TPN solutions
Tutor: Judit Váradi D.Pharm., Ph.D.

23. Title: Biopharmaceuticals - antibody therapeutics
24. Title: Biopharmaceutics
25. Title: Formulation of delayed-release tablets
26. Title: Manufacturing of biopharmaceuticals
Tutor: Ferenc Fenyvesi D.Pharm., Ph.D.

27. Title: Formulation techniques of Solid Self-Microemulsifying drug delivery systems
28. Title: Possibilities for the development of Plantago Lanceolata extract-loaded lipid based formulations
Tutor: Zoltán Ujhelyi D.Pharm., Ph.D.

compilation)
3. Title: Newly approved antibiotics (literature compilation)
4. Title: Synthesis of glycopeptide antibiotic derivatives
5. Title: The history of ristocetin and ristocetin aglycon (literature compilation)
Tutor: Ilona Bakai-Bereczki Ph.D.

6. Title: Oral anticoagulants (literature compilation)
7. Title: Sulfated oligosaccharides as inhibitors of angiogenesis, tumor growth, and metastasis saccharides (literature compilation)
8. Title: Synthesis of thio-linked glycomimetics by photoinduced hydrothiolation of glycals
Tutor: Anikó Borbás Ph.D., D.Sc.

9. Title: Application of thiol-addition in the synthesis of glycoconjugates
10. Title: Synthesis of chimera-type antibiotics
11. Title: Synthesis of potential ligands of bactericidal lectines
Tutor: Magdolna Csávás Ph.D.

12. Title: Efficient synthesis of idose/iduronic acid monosaccharide building blocks
13. Title: Synthesis and biological study of sulfonic-acid containing maltooligomers
14. Title: Synthesis and characterisation of carbohydrate based nitrogen containing tricycles
15. Title: Synthesis of heparin analogue anticoagulant oligosaccharides
16. Title: Synthesis of multivalent dirhamnoside derivatives
Tutor: Mihály Herczeg Ph.D.

Department of Pharmaceutical Surveillance and Economics

1. Title: Interactions in the practice of Pharmacovigilance by the aspects of a patient
2. Title: The practice of pharmacovigilance by the aspects of pharmacists and physicians
3. Title: Theory and practice of risk evaluation and risk management
Tutor: Béla Tóth E. M.D., Ph.D.

Department of Biopharmacy

1. Title: Any subject from the field of biopharmacy
Tutor: Gábor Halmos D.Pharm., Ph.D.

CHAPTER 23
WRITING AND DEFENDING A THESIS

(1) The thesis topics, and names of the supervising teachers are available in the faculty bulletin, in the program description and on the website of the faculty.
(2) The Educational Units [departments] put together the list of theses to be announced (with the names of the consultants), which is included in the program description. The student is to choose from this list, and any deviation from it, has to be approved by the heads of the aforementioned Educational Units. The student is required to choose the topic of his/ her thesis before the last week of the second semester in the fourth academic year. In case the student intends to choose an experimental topic, he/she is expected to declare it before the last week of the first semester of the fourth academic year. The titles of the thesis must be submitted to the Dean's Office in the last week of the first or second semester of the fourth academic year.
(3) The thesis can be done as part of research under the auspices of the Students' Scientific Association (SSA). An essay can be accepted as a thesis, on condition it has been acknowledged by the panel of judges of the local SSA conference as a thesis and thereby the specific essay was graded 'excellent'; in case of an essay with multiple authors it can be accepted as a thesis in its original form if the declaration of waiver by the other authors is attached. The documents regarding the acceptance of the thesis (evaluations, answers) must be submitted in an attachment. It is also necessary to fill in and submit a questionnaire containing details (title, authors, departments, supervisors) of the essay and SSA presentation.
(4) The deadline to submit the thesis at the Faculty of Pharmacy is three months before the written final exam. In case the student fails to do this by the deadline, he/she can take his/her comprehensive exams, but cannot take the state exam. The deadline to submit the thesis can be postponed up to two weeks in specific cases, with the supervisor's suggestion and with the permission from the head of the Education Committee.
(5) The thesis must be submitted in two copies at the Education Office and electronically uploaded to the electronic archive of the University and National Library of the University of Debrecen before the beginning of the written final exam. It should not exceed 40 typed pages in length. The typed or word processed and printed thesis must be submitted bound and in an aesthetic design. Margins must be 2.5 cm at the top and bottom, and 3 cm on the left and right. Its structure and the process of evaluation must meet requirements as follows:

a) The thesis can outline the author's own experimental activities; it can be a case study, a clinicopathological or statistical analysis or even a summary of scientific literature. It should not necessarily contain new scientific results but is should definitely sum up the author's individual work in a specific field. Results other than the author's own should be specified exactly. The front page should contain information as follows: the title of the thesis, author's name, supervisor's name, name of the educational unit in which the thesis was written, name of the head of department and date of accomplishment. The thesis can be submitted in the possession of signatures from the supervisor and head of department. (Specimen documents/forms can be downloaded from the homepage of the Faculty). Introduction, aims, results and discussion should be arranged in separate chapters. Furthermore, the thesis should also contain a summary (of maximum two printed pages). Bibliographic information should be organized as follows: authors' names (first names by initials), full title of publication, name of journal where it appeared, number of volume, page(s) and year of publication. In case a book is referred to, the name(s) of the book's author(s) and of the publisher should both be provided. The number of references should fall in the range of 20-50 publications.
b) On evaluating a thesis, referees will consider its logical organization and professional relevance,

the methods applied and the accuracy through which results have been presented.
c) The supervisor of the thesis will evaluate the author's professional activities and, together with the thesis, submit the written evaluation in two copies to the Education Office and the person(s) in charge at the specific department. (Specimen documents/forms can be downloaded from the homepage of the Faculty).
d) The submitted thesis will be allocated to two referees at the official request of a professional board appointed by the Educational Committee of the Faculty. In case a referee fails to fulfil his commitment, he should return the thesis to the Education Office without delay. Referees should prepare and send two printed copies of their written evaluation to the Education Office, while the electronic version should be sent to both the Education Office and student (author) within two weeks of submission. If neither referee accepts the thesis, the student has to re-write it with due consideration of the critical remarks made by the referees. If only one of the two referees accepts the thesis, it should be allocated to a third judge whose opinion will be exclusively considered in the future. A candidate can orally defend his/her thesis if both referees have accepted it.
Students will get a written evaluation from the referees and they must respond – even if they agree with the remarks – in both written and electronical form within one week of receipt and send their (written) response to both the Education Office and referees. Referees should electronically declare their acceptance of the student's response within five days.
The thesis must be defended in the educational unit in which the topic was announced, in front of thesis defense committees appointed by the Dean's Office. The defense itself will take place in front of a committee including three members. The chairperson of the defense committee should be a head tutor of the faculty, while the members are selected as follows: one of the certified tutors of the faculty and a person keeping the minutes, the head of the education unit or a head tutor (chairperson) appointed by him/her, and the referees. The supervisor and the referees must be invited to participate at the event of defense. The committee evaluates the thesis in a closed session.
A thesis defense report is made in three copies containing the student's name, the title of the thesis, date and place of defense and the mark/grade approved by the committee. One of the copies belongs to the educational unit of the faculty, the other two are sent to the Education Office by the institute.
One copy of the thesis shall be kept in the educational unit of the faculty for five years, one copy is returned to the student and one copy is sent to the Kenézy Library where it can be read but not borrowed.
The following should be attached to the thesis:
the supervisor's report which is the written evaluation of the candidate
a summary of the thesis with name and title
plagiarism declaration form in which the student declares that the thesis is his/her own work
a request for limited access to thesis form - if needed
The final exam (test) consists of a practical and oral part.
The chair and the members of the committee are appointed by the Dean or the Vice Dean.
The date of the written state exam is appointed by the Ministry of Education.
The dates of the practical and oral state exams are assigned by the Dean's Office. The exam is conducted in front of a state examining committee of three to five people. The examination committee at the practical final exam at the Faculty of Pharmacy consists of two tutors of the university appointed by the Dean's Office. The examination board at the theoretical exam is presided by a recognized scientist in the field of pharmacy, while the members are two head tutors of the Faculty and a person keeping the minutes. The Dean's Office can appoint more than one examination board to conduct simultaneous theoretical exams.

CHAPTER 24
LIST OF TEXTBOOKS

BMC

Introduction to Biophysics I.:
Serway/Vuille: College Physics.
10th edition. Cengage Learning, 2014. ISBN: 978-1285737027.
Gáspár R.: Physics for BMC students.
University of Debrecen.

Introduction to Medical Chemistry I.:
McMurry, J., Fay, R.C.: Chemistry.
7th edition. Pearson Education, 2015. ISBN: 978-0321943170.

Introduction to Medical Chemistry II.:
McMurry, J., Fay, R.C.: Chemistry.
7th edition. Pearson Education, 2015. ISBN: 978-0321943170.
F., Erdődi, Cs., Csortos: Organic Chemistry for Premedical Students.
University of Debrecen, 2011.

Introduction to Biology I.:
Sadava, Hillis, Heller, Berenbaum: Life: The Science of Biology.
10th edition. Sinauer Macmillan, 2013. ISBN: 978-1-4641-4124-9.

Introduction to Biophysics II.:
Serway/Vuille: College Physics.
10th edition. Cengage Learning, 2014. ISBN: 978-1285737027.
Gáspár R.: Physics for BMC students.
University of Debrecen.

Introduction to Biology II.:
Sadava, Hillis, Heller, Berenbaum: Life: The Science of Biology.
10th edition. Sinauer Macmillan, 2013. ISBN: 978-1-4641-4124-9.

English for BMC students:
Soars, John and Liz: Headway - Pre-Intermediate Students' Book and Workbook.
The 3rd edition. Oxford.

SBMC

Introduction to Biophysics:
Serway/Vuille: College Physics.
10th edition. Cengage Learning, 2014. ISBN: 978-1285737027.

Introduction to Medical Chemistry:
McMurry, J., Fay, R.C.: Chemistry.
7th edition. Pearson Education, 2015. ISBN: 978-0321943170.
F., Erdődi, Cs., Csortos: Organic Chemistry for Premedical Students.
University of Debrecen, 2011.

Introduction to Biology:
Sadava, Hillis, Heller, Berenbaum: Life: The Science of Biology.
10th edition. Sinauer Macmillan, 2013. ISBN: 978-1-4641-4124-9.

1st year

Hungarian Crash Course:
Marschalkó, Gabriella: Hungarolingua Basic Level 1.
Debreceni Nyári Egyetem, 2011.

Mathematics:
Fong Yuen, Wang Yuan: Calculus.
Springer, Singapore, 2000.

General Chemistry Theory:
J. McMurry, R. C. Fay: General Chemistry.
4th edition. Pearson Education Inc., 2004. ISBN: 0-13-121631-7.

General Chemistry Practice:
J. McMurry, R. C. Fay: General Chemistry.
4th edition. Pearson Education Inc., 2004. ISBN: 0-13-121631-7.

Pharmaceutical Biology I.:
Alberts B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P.:

Essential Cell Biology.
4th edition. Garland Science, 2014. ISBN: 978-0-8153-4455-1.

Latin Language I.:
Takácsné Tóth Emőke: Latin for Pharmacy Students.
Debrecen.2012.

Computer Science:
Greg Perry: Microsoft Office.
2007. ISBN: 9789-6396-3737-5.

Hungarian Language I/1.:
Győrffy Erzsébet, Ph.D.: Hogy s mint? I..
2013.

Latin Language II.:
Takácsné Tóth Emőke: Latin for Pharmacy Students II..
Debrecen.2012.

Inorganic and Qualitative Analytical Chemistry Theory:
McMurry, J., Fay, R.C.: Chemistry.
7th edition. Pearson Education, 2015. ISBN: 978-0321943170.
G. Svehla (reviser): Vogel's qualitative inorganic analisis.
6th edition. Longman Scientific & Technical, copublished in the United States with John Wiley & Sons, Inc., 1994. ISBN: 0-582-45090-x.
N. N. Greenwood and A. Earnshaw: Chemistry of the elements.
2nd edition. Butterworth-Heinemann, Reed Educational and Professional Publishing Ltd., 1997. ISBN: 0-7506-3365-4.
H. F. Holtzlaw, Jr. W. R. Robinson: College Chemistry with Quantitative Analysis.
8th edition. D. O. Health and Company, Lexington, Massachusetts, Toronto, 1988. ISBN: 0-669-12862-7.
T. Moeller, J. C. Bailer, Jr., J. Kleinbert, C. O. Guss, M. E. Castellion, C. Metz: Chemistry with inorganic qualitative analysis.
8th edition. Academic Press Inc., 1980.
T. Moeller, R. O' Connor: Ions in Aquenous Systems, an introduction to chemical equilibrum and solution chemistry.
McGraw-Hill Book Companies, 1972. ISBN: 07-042647-3-.

Inorganic and Qualitative Analytical Chemistry Practice:
McMurry, J., Fay, R.C.: Chemistry.
7th edition. Pearson Education, 2015. ISBN: 978-0321943170.
G. Svehla (reviser): Vogel's qualitative inorganic analisis.
6th edition. Longman Scientific & Technical, copublished in the United States with John Wiley & Sons, Inc., 1994. ISBN: 0-582-45090-x.
N. N. Greenwood and A. Earnshaw: Chemistry of the elements.
2nd edition. Butterworth-Heinemann, Reed Educational and Professional Publishing Ltd., 1997. ISBN: 0-7506-3365-4.
H. F. Holtzlaw, Jr. W. R. Robinson: College Chemistry with Quantitative Analysis.
8th edition. D. O. Health and Company, Lexington, Massachusetts, Toronto, 1988. ISBN: 0-669-12862-7.

Biophysics:
Biophyisics laboratory manual.
Department of Biophysics and Cell Biology, 2001.
Wayne W. Daniel: Biosatatistics: a foundation for analysis in the health sciences.
7th edition. John Wiley and Sons, New York, 1991. ISBN: 0-471-52988-5.
M. Shinitzky: Biomembranes. Physical aspects.
Vch. Weinheim, 1993. ISBN: 3-527-3021-x.
Edited by János Szőllősi: Medical Biophysics.
Medicina, 2009.
Materials.
URL: www.biophys.dote.hu
Textbook online.
URL:
http://www.biophysics.org/education/resources.htm

Physical Chemistry I.:
Peter Atkins and Julio de Paula: Physical chemistry for life sciences.
or newer edition. Oxford University Press, 2006.
R. Chang: Physical chemistry with applications

to biological systems.
Macmillan, New York, 1977.
P. W. Atkins, J. de Paula: Elements of Physical Chemistry.
4th or later edition. Oxford Univ. Press, 2005.

Organic Chemistry Theory I.:

T. W. G. Solomon, C. B. Fryhle: Organic chemistry.
8th edition. John Wiley and Sons Inc., 2004.
E. K. Meislich, H. Meilich, J. Sharefkin: 3000 solved problems in organic chemistry.
McGraw Hill Inc., 1994.
T. Eicher, S. Hauptmann,: Chemistry of heterocycles: Structures, reactions, synthesis and applications.
2nd edition. John Wiley and Sons Inc., 2003.
E. L. Eliel, S. H. Wilen: Stereochemistry of organic compounds.
1st edition. John Wiley and Sons Inc., 1994.
R. Norman, J. M. Coxon: Principles of organic synthesis.
3rd edition. Blackie academic & Professional, 1993.
L.G. Wade Jr.: Organic Chemistry.
4th edition.1999.
J.A. Miller, E.F. Neuzil: Modern Experimental Organic Chemistry.
D.C. Heath and Company, 1980.

First Aid and Reanimation:

József Betlehem: First Things to Be Done in Emergencies – Providing First Aid for Health Professionals.
Medicina Könyvkiadó Zrt., 2012.

Pharmaceutical Biology II.:

Hartl D. L.: Essential Genetics: A Genomics Perspective.
6th edition. Jones & Bartlett Publishers, 2014. ISBN: 978-1-4496-8688-8.
Practical Courses in Genetics.
University Medical School of Debrecen, 2002.
Thomas D. Gelehrter, Francis S. Collins, David Ginsburg: Principles of Medical Genetics.
2nd. Williams and Wilkins, 1998. ISBN: 0-683-03445-6.
Tom Strachan, Andrew P. Read: Human Molecular Genetics.
4th. Garland Science, 2011. ISBN: 0-8153-4184-9.
Robert L. Nussbaum, Roderick R. McInnes, Huntington F. Willard, Ada Hamosh: Thompson and Thompson Genetics in Medicine.
7th edition. Saunders Elsevier, 2007. ISBN: 978-1-4160-3080-5.
Campbell, A. M., Heyer, L. J.: Discovering genomics, proteomics and bioinformatics.
Pearson Education Inc. ISBN: 0-8053-4722-4.
Eberhard Passarge: Color Atlas of Genetics.
2nd edition. Georg Thieme Verlag, 2001. ISBN: 3-13-100362-6.

Hungarian Language I/2.:

Győrffy Erzsébet, Ph.D.: Hogy s mint? I.
2013.

Pharmaceutical Anatomy:

Moore, K. L., Agur, A. M. R.: Essential Clinical Anatomy.
5th edition. Lippincott Williams & Wilkins, 2014. ISBN: 1-4511-8749-1.
T. W. Sadler: Langman's Medical Embriology.
10th edition. Lippincott Williams & Wilkins, 2006. ISBN: 0-7817-9485-4.
Sobotta: Atlas of Human Anatomy I.-II.
14th edition. Urban & Schwarzenberg. ISBN: 978-0-443-10349-0.
L.P. Gartner: Concise Histology.
Saunders, Elsevier, 2011. ISBN: 978-0-7020-3114-4.

2nd year

Organic Chemistry Theory II.:

T. W. G. Solomon, C. B. Fryhle: Organic chemistry.
8th edition. John Wiley and Sons Inc., 2004.
E. K. Meislich, H. Meilich, J. Sharefkin: 3000 solved problems in organic chemistry.
McGraw Hill Inc. , 1994.
T. Eicher, S. Hauptmann,: Chemistry of heterocycles: Structures, reactions, synthesis and applications.
2nd edition. John Wiley and Sons Inc., 2003.
E. L. Eliel, S. H. Wilen: Stereochemistry of organic compounds.
1st edition. John Wiley and Sons Inc., 1994.
R. Norman, J. M. Coxon: Principles of organic

synthesis.
3rd edition. Blackie academic & Professional, 1993.
L.G. Wade Jr.: Organic Chemistry.
4th edition.1999.
J.A. Miller, E.F. Neuzil: Modern Experimental Organic Chemistry.
D.C. Heath and Company, 1980.

Quantitative Analytical Chemistry Theory I.:

1. Skoog, D. A., West, D. M., Holler, F. J.: Fundamentals of Analytical Chemistry.
Saunders College Publ., 1988.
Braun, R. D.: Introduction to Instrumental Analysis.
Marcel Dekker Inc., 1987.
Fifield, F. W., Kealey, D.: Principles and Practice of Analytical Chemistry.
Blackie Academic and Professional, 1995.
Harris, D. C.: Quantitative Chemical Analysis.
W.H. Freeman and Company, 2003.

Human Physiology I.:

A. Fonyó: Principles of Medical Physiology.
Medicina Publishing House, Hungary, 2002.
ISBN: 963-242-726-2.
R. M. Berne, M. N. Levy, B. M. Koeppen, B. A. Stanton: Physiology.
5th edition. V.C. Mosby Co., 2003.

Pharmaceutical Biochemistry I.:

Berg J.M., Tymoczko, J. L., Stryer, L.: Biochemistry.
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