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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,
INTRODUCTION

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 (17 October, 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**

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<tr>
<th>Position</th>
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<tr>
<td>Director</td>
<td>Prof. Attila Jenei Ph.D.</td>
<td></td>
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<tr>
<td>Program Coordinator</td>
<td>Prof. Ferenc Erdődi Ph.D, D.Sc.</td>
<td></td>
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<tr>
<td>BMC Coordinator</td>
<td>Ms. Beáta Lontay Ph.D.</td>
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### CHAPTER 4

**Manager Assistants**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Ms. Anna Kapitány M.Sc.</td>
<td></td>
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<td>Ms. Andrea Tiba B.Sc.</td>
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**Contract & Marketing Coordinator**

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<td>Ábrahám Gergely Varga J.D.</td>
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**Financial Coordinator**

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<td>Ms. Rita Kovács J.D.</td>
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**Agent Coordinator**

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<tr>
<td>József Harmati J.D.</td>
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**English Program Coordinators**

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<tbody>
<tr>
<td>Ms. Dóra Benkő B.A.</td>
<td>(Admissions, Visa issues, BMC)</td>
</tr>
<tr>
<td>Ms. Adrienn Gagna-Szakó M.Sc.</td>
<td>(Admissions, BMC, US Loans, Wyckoff HMC Applications)</td>
</tr>
<tr>
<td>Ms. Anett Galvácsi M.A.</td>
<td>(Tuition fee, Financial Certificates, Refunds, USMLE Coordinator)</td>
</tr>
<tr>
<td>Ms. Katalin Györe M.A.</td>
<td>(Admissions, Visa issues, BMC)</td>
</tr>
<tr>
<td>Ms. Krisztina Németh M.Sc.</td>
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</tr>
<tr>
<td>Ms. Enikő Sallai M.Sc.</td>
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<tr>
<td>Ms. Bella Brigitta Szilágyi M.A.</td>
<td>(Stipendium Hungaricum Coordinator)</td>
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**IT Project Coordinator**

<table>
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<tr>
<td>Imre Szűcs B.Sc.</td>
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CHAPTER 5
BASIC MEDICINE COURSE

BASIC MEDICINE COURSE - INTRODUCTION TO BIOLOGY
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<tr>
<td>Vice-Dean for Educational Affairs</td>
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<tr>
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<td>Ms. Adina Fésüs D.Pharm., M.Sc.</td>
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<td>István Kraszits D.Pharm.</td>
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<td>Ms. Orsolya Kungler-Gorácz D.Pharm.</td>
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<td>Csongor Szabó D.Pharm., M.Sc.</td>
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<tr>
<td>Invited Lecturer</td>
<td>Antal Ferenc Bálint D.V.M.</td>
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                                           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.
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PhD Student                            Ms. Kalantari Azin D.Pharm.
                                           Ms. Eszter Róka D.Pharm.
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                                           István Lekli D.Pharm., Ph.D.
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                                           Attila Czompa D.Pharm., Ph.D.
Resident                     Ms. Kitt Szöke D.Pharm.
Research Assistant           Ms. András Czeglédi M.Sc.
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<tr>
<td>PhD Student</td>
<td>Ms. Alexandra Gyöngyösi D.Pharm.</td>
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<td>Péter Szabados-Fürjesi M.Sc.</td>
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<td>Ms. Rita Zilinyi M.Sc.</td>
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<td>Academic Advisor</td>
<td>István Lekli D.Pharm., Ph.D.</td>
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### CHAPTER 7

**FACULTY OF MEDICINE - DEPARTMENTS OF BASIC SCIENCES**

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<tr>
<td>Associate Professor, Head of the Department</td>
<td>Péter Szücs M.D., Ph.D.</td>
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<tr>
<td>Full Professor, Head of Oral Anatomy Division</td>
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</tr>
<tr>
<td>Full Professor</td>
<td>Miklós Antal M.D., Ph.D., D.Sc.</td>
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<td>Professor Emeritus</td>
<td>István Földes M.D., Ph.D., D.Sc.</td>
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<td>László Módis M.D., Ph.D., D.Sc.</td>
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<td>György Székely M.D., Ph.D., D.Sc., M.H.A.Sc.</td>
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<td>Associate Professor</td>
<td>András Birinyi M.Sc., Ph.D.</td>
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<td>Szabolcs Felszeghy Ph.D., D.D.S.</td>
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<td>Ervin Wolf M.Sc., Ph.D.</td>
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<td>Assistant Professor</td>
<td>Ms. Róza Zákány M.D., Ph.D.</td>
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<td>Zoltán Mészár M.Sc., Ph.D.</td>
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<td>Postgraduate Lecturer</td>
<td>Ms. Cintia Angel M.Sc.</td>
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<td>Ms. Zsófia Antal M.D., Ph.D.</td>
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<td>Ms. Szilvia Kecskés M.Sc., Ph.D.</td>
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<td>Ms. Annamária Kenyeres M.Sc.</td>
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<td>Ms. Lívia Kicska M.Sc.</td>
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<td>Ms. Gréta Kis M.Sc.</td>
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</table>
Ms. Ildikó Papp M.Sc., Ph.D.
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CHAPTER 7

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<th>Specialty</th>
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<tr>
<td>Registrar</td>
<td>László Dávida M.D.</td>
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<tr>
<td></td>
<td>Ms. Ildikó Földi M.D.</td>
<td>(on maternity leave)</td>
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<td></td>
<td>Ms. Eszter Pályu M.D.</td>
<td>(Internal Medicine)</td>
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<td>Tamás Tornai M.D.</td>
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# CHAPTER 8

## Division of Metabolism

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Ms. Irén Mikó M.D., Ph.D., C.Sc.

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Chief Physician
László Lőrincz M.D.

Clinical Specialist
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Krisztían Szegedi M.D.
Sándor Árpád Tóth M.D.

Clinical Assistant
József Zoltán Kiss M.D.
Dániel Varga M.D.
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Responsible for Educational Matters  Mátyás Benyó M.D., Ph.D.
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                    Ms.  Ilona Mészáros M.Sc., Ph.D., C.Sc.
                    Gábor Vasas M.Sc., Ph.D.
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Péter Buglyó M.Sc., Ph.D.
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Research Fellow

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Ms. Edina Baranyai M.Sc., Ph.D.
Gábor Bellér M.Sc., Ph.D.
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Ms. Ágnes Grenács M.Sc., Ph.D.
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Research Fellow

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Ms. Edina Baranyai M.Sc., Ph.D.
Gábor Bellér M.Sc., Ph.D.
Ms. Linda Biró M.Sc., Ph.D.
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Academic Advisor


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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

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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

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Web: fizkem.unideb.hu/indexe

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

### INSTITUTE OF PHYSICS

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

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<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Professor</td>
<td>József Környei Ph.D.</td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
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<td></td>
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</tbody>
</table>
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CHAPTER 10

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Péter Kakuk M.A., Ph.D.
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                                 Ms. Mariann Gulyásné Szitás M.A.
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                                 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.
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OPENING CEREMONY: September 11, 2016
PHARMACIST GRADUATION: June, 2017

1\textsuperscript{st} SEMESTER

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Examination Period</th>
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<tr>
<td>Basic Medicine Course</td>
<td>September 12 - December 23, 2016 (15 weeks)</td>
<td>December 27, 2016 - February 10, 2017</td>
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<td>(7 weeks)</td>
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<tr>
<td>1\textsuperscript{st} year Pharmacy</td>
<td>September 12 - December 23, 2016 (15 weeks)</td>
<td>December 27, 2016 - February 10, 2017</td>
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<td>2\textsuperscript{nd} year Pharmacy</td>
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<td>(7 weeks)</td>
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<td>3\textsuperscript{rd} year Pharmacy</td>
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<td>4\textsuperscript{th} year Pharmacy</td>
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<tr>
<td>5\textsuperscript{th} year Pharmacy</td>
<td>July 18 - September 23, 2016 (2 months state exam practice) September 26 - December 23, 2016 (13 weeks)</td>
<td>December 27, 2016 – January 27, 2017 (5 weeks)</td>
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2\textsuperscript{nd} SEMESTER

<table>
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<th>Year</th>
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<tr>
<td>BMC</td>
<td>February 13 - May 26, 2017 (15 weeks)</td>
<td>May 29 - June 23, 2017 (4 weeks)</td>
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<td>BMC II</td>
<td>January 09 - June 23, 2017 (24 weeks)</td>
<td>June 26 - July 14, 2017 (3 weeks)</td>
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<td>1\textsuperscript{st} year Pharmacy</td>
<td>February 13 – May 26, 2017 (15 weeks)</td>
<td>May 29 – July 14, 2017 (7 weeks)</td>
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<td>3\textsuperscript{rd} year Pharmacy</td>
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<td>4\textsuperscript{th} year Pharmacy</td>
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<tr>
<td>5\textsuperscript{th} year Pharmacy</td>
<td>January 30 – May 26, 2017 (4 months state exam practice)</td>
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### UNIVERSITY CALENDAR

**SUMMER PRACTICE**

<table>
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<th>YEAR</th>
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<tr>
<td>2(^{nd}) year Pharmacy practice</td>
<td>July 17 - August 11, 2017 or August 14 - September 8, 2017 (4 weeks)</td>
</tr>
<tr>
<td>3(^{rd}) year Pharmacy practice</td>
<td>July 17 - August 11, 2017 or August 14 - September 8, 2017 (4 weeks)</td>
</tr>
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</table>
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 | Bonus |
| the best 3 2nd semester SCTs | points |
| OR the average of the best 6 SCTs |      |
| 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.

<table>
<thead>
<tr>
<th>Percentage (%)</th>
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</tr>
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<tbody>
<tr>
<td>0 - 49.99:</td>
<td>fail (1)</td>
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<tr>
<td>50.00 - 64.99:</td>
<td>pass (2)</td>
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<td>65.00 - 74.99:</td>
<td>satisfactory (3)</td>
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<tr>
<td>75.00 - 84.99:</td>
<td>good (4)</td>
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<tr>
<td>85.00 - 100:</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

Absence for any reason counts as 0%.

Course coordinator: Dr. Beáta Lontay, Department of Medical Chemistry
CHAPTER 12

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

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
</tr>
</thead>
</table>
| 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.                    |
| 7th week  | **Lecture:** Nutrition, Digestion and Absorption 2.                    |
|           | Nutrition, Digestion and Absorption 3.                                  |
| 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 3.                             |

Contact person: Dr. András Penyige; Department of Human Genetics
Subject: INTRODUCTION TO BIOPHYSICS I.
Year, Semester: Basic Medicine Course 1st
Number of teaching hours:
Lecture: 60
Seminar: 30

1st week:

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

3rd week:

4th week:

5th week:

6th week:

7th week:

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:

10th week:

11th week:

12th week:

13th week:

14th week:

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:

2nd week:

3rd week:

4th week:

5th week:

6th week:

7th week:

8th week:

9th week:

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

11th week:

12th week:

13th week:

14th week:
Lecture: Preparation for the final exam.

15th week:
Lecture: Final exam.

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

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

Subject: INTRODUCTION TO MEDICAL CHEMISTRY I.

Year, Semester: Basic Medicine Course 1st
Number of teaching hours:
Lecture: 60
Seminar: 30

1st week:

2nd week:

3rd week:

4th week:

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:

7th week:

8th week:

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

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:

11th week:

12th week:

13th week:

14th week:

15th week:
Lecture: FOURTH SELF CONTROL TEST. Summary and discussion.
1st week:

2nd week:

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:

6th week:

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:

11th week:

12th week:

13th week:

14th week:

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:

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

5th week:

6th week:
Self Control Test

7th week:

8th week:

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:

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
CHAPTER 12

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:

<table>
<thead>
<tr>
<th>Final score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 59</td>
<td>fail (1)</td>
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<tr>
<td>60-69</td>
<td>pass (2)</td>
</tr>
<tr>
<td>70-79</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>80-89</td>
<td>good (4)</td>
</tr>
<tr>
<td>90-100</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>The average of the best 5 SCTs</th>
<th>Bonus points</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>1</td>
</tr>
<tr>
<td>52</td>
<td>3</td>
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<td>53</td>
<td>5</td>
</tr>
<tr>
<td>54</td>
<td>7</td>
</tr>
</tbody>
</table>

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**

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

2\textsuperscript{nd} week:
**Lecture:** Proteins, carbohydrates and lipids 3.
Proteins, carbohydrates and lipids 4.

3\textsuperscript{rd} week:
**Lecture:** Nucleic acids and the origin of life 1.
Nucleic acids and the origin of life 2.

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

5\textsuperscript{th} 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:
CHAPTER 13

Lecture: Neurons and Nervous system.
Sensory systems

23rd week:
Lecture: Effectors: How animals get things done.

24th 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


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

1st week:
Motion in one dimension, displacement, velocity, acceleration, motion diagrams.

2nd week:
Displacement, velocity and acceleration in two dimensions. Motion in two dimensions.
Relative velocity.

3rd week:
Self Control Test

4th week:
Spring potential energy. System and energy conservation. Power. Work done by varying forces.

5th week:
Lecture: 9-10. Momentum and impulse.

Conservation of momentum.

6th week:

7th week:
Rotational kinetic energy. Angular momentum.
Self Control Test

8th week:
Deformation of solids. The Youngs’s, shear and bulk modulus.

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

10th week:

11th week:
Self Control Test

12th week:

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

14th week:

15th week:

16th week:

Resistivity, temperature variation of resistance. Semiconductors and superconductors. Electrical activity of the heart. Defibrillators.

17th week:

18th week:

19th week:

20th week:

21st week:

22nd week:
aberrations.

23rd week:  

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

24th week:  

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:  

2nd week:  

3rd week:  

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

5th week:  

6th week:  

7th week:  
8th week:

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:

11th week:

12th week:

13th week:

14th week:

15th week:

16th week:

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

18th week:

19th week:

20th week:

21st week:

22nd week:

23rd week:

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 (6th edition)
                   Erdődi, Csortos: Organic chemistry for premedical students (2010)
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.

For the previous years’ curriculum please visit the university website: www.edu.unideb.hu
### Compulsory courses for the 1. year

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<thead>
<tr>
<th>Sem</th>
<th>Subjects</th>
<th>Neptun code</th>
<th>L</th>
<th>S</th>
<th>P</th>
<th>Exam</th>
<th>Crd</th>
<th>Prerequisites of taking the subject</th>
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<tbody>
<tr>
<td>1</td>
<td>General Chemistry Practice</td>
<td>GYAKE04P1</td>
<td>15</td>
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<td>Hungarian Crash Course</td>
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<td>Latin Language I.</td>
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| 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          |
<p>| 2   | Thesis                     | GYDIP44P10    |   |    |    | AW5  | 8   | Thesis Consultation                                                                             |</p>
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This model curriculum applies to those who started their studies on Pharmacy Program in the academic year 2016-17.

For the previous years’ curriculum please visit the university website: www.edu.unideb.hu
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.
CHAPTER 15

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
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.
CHAPTER 15

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:

<table>
<thead>
<tr>
<th>Xave percentage</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-59.99</td>
<td>FAIL(1)</td>
</tr>
<tr>
<td>60-69.99</td>
<td>PASS(2)</td>
</tr>
<tr>
<td>70-79.99</td>
<td>SATISFACTORY(3)</td>
</tr>
<tr>
<td>80-89.99</td>
<td>GOOD(4)</td>
</tr>
<tr>
<td>90-100</td>
<td>EXCELLENT(5)</td>
</tr>
</tbody>
</table>

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:
6. Compulsory reading:

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.
ACADEMIC PROGRAM FOR THE 1ST YEAR

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

<table>
<thead>
<tr>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00 - 10.30: language classes</td>
</tr>
<tr>
<td>10.30 – 11.00: break</td>
</tr>
<tr>
<td>11.00 - 12.30: language classes</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>1st week:</th>
<th>2nd week:</th>
<th>3rd week:</th>
<th>4th week:</th>
<th>5th week:</th>
<th>6th week:</th>
<th>7th week:</th>
<th>8th week:</th>
<th>9th week:</th>
<th>10th week:</th>
<th>11th week:</th>
<th>12th week:</th>
</tr>
</thead>
</table>
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:

<table>
<thead>
<tr>
<th>Final score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 59</td>
<td>fail (1)</td>
</tr>
<tr>
<td>60-69</td>
<td>pass (2)</td>
</tr>
<tr>
<td>70-79</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>80-89</td>
<td>good (4)</td>
</tr>
<tr>
<td>90-100</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

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.


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**

<table>
<thead>
<tr>
<th>1st week:</th>
<th>9th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>Introduction to Pharmaceutical</td>
<td>Regions; formation of adjectives</td>
</tr>
<tr>
<td>Terminology</td>
<td></td>
</tr>
<tr>
<td>Anatomical planes</td>
<td></td>
</tr>
<tr>
<td>and directions.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2nd week:</th>
<th>10th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>Declension of</td>
</tr>
<tr>
<td>substances,</td>
<td>adjectives with</td>
</tr>
<tr>
<td>Chemistry terms</td>
<td>3 endings; joints</td>
</tr>
<tr>
<td></td>
<td>and bony</td>
</tr>
<tr>
<td></td>
<td>connections.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3rd week:</th>
<th>11th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>The human body;</td>
<td>Names of joints;</td>
</tr>
<tr>
<td>Greek and Latin</td>
<td>declension of</td>
</tr>
<tr>
<td>equivalents</td>
<td>numbers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4th week:</th>
<th>12th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>Names of plants</td>
<td>3rd declension;</td>
</tr>
<tr>
<td>and plant parts;</td>
<td>Declension of</td>
</tr>
<tr>
<td>names of chemical</td>
<td>adjectives with</td>
</tr>
<tr>
<td>compounds</td>
<td>1 or 2 endings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5th week:</th>
<th>13th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>Parts of</td>
<td>Summary of the</td>
</tr>
<tr>
<td>prescriptions,</td>
<td>declensions and</td>
</tr>
<tr>
<td>types of</td>
<td>adjectives</td>
</tr>
<tr>
<td>prescriptions in</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6th week:</th>
<th>14th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>The human skeleton</td>
<td>Revision</td>
</tr>
<tr>
<td>; numbers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7th week:</th>
<th>15th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>Pharmacy preparations and</td>
<td>Closing of the</td>
</tr>
<tr>
<td>containers; 1st and 2nd</td>
<td>semester,</td>
</tr>
<tr>
<td>declension</td>
<td>evaluation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practical:</strong></td>
</tr>
<tr>
<td>Revision</td>
</tr>
</tbody>
</table>

### 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:

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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

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**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. 


**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:**

**Practical:** 7. Cytoskeleton, cell junctions and extracellular matrix. Study of electron micrographs. Reaction catalysis. 

**7th week:**
**Lecture:** 14. The cell nucleus. 15. Chromatin and chromosomes. 


**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. 


**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:**

**Practical:** 13. Immunocytochemical reactions. Demonstration of immunoglobulin producing lymphocytes. Examination on the use of light microscope. 

**14th week:**
**Lecture:** No lecture scheduled. 


**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:

<table>
<thead>
<tr>
<th>Percentage (%)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 49.99</td>
<td>fail (1)</td>
</tr>
<tr>
<td>50.00 - 61.99</td>
<td>pass (2)</td>
</tr>
<tr>
<td>62.00 - 69.99</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>70.00 - 79.99</td>
<td>good (4)</td>
</tr>
<tr>
<td>80.00 - 100</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Average of the 3 tests (%)</th>
<th>Bonus %</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.00 - 53.99</td>
<td>3</td>
</tr>
<tr>
<td>54.00 - 57.99</td>
<td>4</td>
</tr>
<tr>
<td>58.00 - 61.99</td>
<td>5</td>
</tr>
<tr>
<td>62.00 - 65.99</td>
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<td>82.00 - 85.99</td>
<td>11</td>
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<tr>
<td>86.00 - 100</td>
<td>12</td>
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</tbody>
</table>

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.

6th week:
*Seminar:* Exercises based on acid-base titrations. Stoichiometric calculations based on chemical equations.

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
#1 Determination of the composition of a mixture of KClO3 and KCl. Melting point measurement: the melting point of Na2S2O3 Determination of the melting point of purified benzoic acid. Substance #1 due in.

9th week:
*Seminar:* Balancing of redox reactions. Calculations based on redox reactions.

10th week:
*Seminar:* Balancing of redox reactions. Calculations based on redox titrations.

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.

14th week:
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:

3rd week:

4th week:

5th week:

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:

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:**

**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:**

**14th week:**

**15th week:**

**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

<table>
<thead>
<tr>
<th>1st week:</th>
<th>8th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong> The methods of Greek, Roman and Arab treatments.</td>
<td><strong>Lecture:</strong> The development of pharmacies.</td>
</tr>
<tr>
<td><strong>Practical:</strong> The methods of Greek, Roman and Arab treatments.</td>
<td><strong>Practical:</strong> The development of pharmacies.</td>
</tr>
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<table>
<thead>
<tr>
<th>2nd week:</th>
<th>9th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong> Pharmaceutics in ancient times and in middle ages.</td>
<td><strong>Lecture:</strong> The pharmaceutical career as a profession.</td>
</tr>
<tr>
<td><strong>Practical:</strong> Pharmaceutics in ancient times and in middle ages.</td>
<td><strong>Practical:</strong> The pharmaceutical career as a profession.</td>
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<thead>
<tr>
<th>3rd week:</th>
<th>10th week:</th>
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</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> The development of anatomical and morphological thinking.</td>
<td><strong>Lecture:</strong> The structural build-up of the Hungarian public health.</td>
</tr>
<tr>
<td><strong>Practical:</strong> The development of anatomical and morphological thinking.</td>
<td><strong>Practical:</strong> The structural build-up of the Hungarian public health.</td>
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<tr>
<th>4th week:</th>
<th>11th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> The development of bacteriological thinking.</td>
<td><strong>Lecture:</strong> Drug as remedy.</td>
</tr>
<tr>
<td><strong>Practical:</strong> The development of bacteriological thinking.</td>
<td><strong>Practical:</strong> Drug as remedy.</td>
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<tr>
<th>5th week:</th>
<th>12th week:</th>
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</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> The development of physiological thinking.</td>
<td><strong>Lecture:</strong> Grouping of drugs. (origin, therapeutic effect, the area of utilization, the method of administration)</td>
</tr>
<tr>
<td><strong>Practical:</strong> The development of physiological thinking.</td>
<td><strong>Practical:</strong> Grouping of drugs. (origin, therapeutic effect, the area of utilization, the method of administration)</td>
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<tr>
<th>6th week:</th>
<th>13th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> The history of the development of medical departments.</td>
<td><strong>Lecture:</strong> Drug supply. The functional conditions of pharmacies (personal, material).</td>
</tr>
<tr>
<td><strong>Practical:</strong> The history of the development of medical departments.</td>
<td><strong>Practical:</strong> Drug supply. The functional conditions of pharmacies (personal, material).</td>
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<table>
<thead>
<tr>
<th>7th week:</th>
<th>14th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Factors that helped in the development of theoretical and practical pharmacy in Hungary.</td>
<td><strong>Lecture:</strong> The professional books, journals in a pharmacy. (Pharmacopoeia, Hungarian/foreign). Formulae Normales (pharmaceutical and medical edition). Prescriptions.</td>
</tr>
<tr>
<td><strong>Practical:</strong> Factors that helped in the development of theoretical and practical pharmacy in Hungary.</td>
<td><strong>Practical:</strong> The professional books, journals in a pharmacy. (Pharmacopoeia, Hungarian/foreign). Formulae Normales (pharmaceutical and medical edition). Prescriptions.</td>
</tr>
</tbody>
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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:

2nd week:

3rd week:

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

5th week:

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

7th week:

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

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

10th week:

11th week:

12th week:

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:

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. Kinematics, description of motion, velocity, acceleration, path, path length
2. Planar motion, projectiles, rotation, vibration.
6. Ellastic media, the hooke law, waves, wave propagation, wave equation, harmonic waves.
8. The light. Propagation velocity. geometrical optics of light rays, reflection, refraction, relative and absolute index of refraction the Fermat principle.
10. Light as an electromagnetic wave, and light as a quanta. Connection between the color and the wavelength, The photon, Photoelectric effect.
12. The nucleon. Law of radioactive decay. binding energy and the mass defect. Description of the nuclear forces.
13. 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.

2nd week:
Seminar: Histology of connective tissue.

3rd week:
Seminar: Histology of adipose tissue, cartilage and bone.

4th week:
Seminar: Histology of bone formation and muscle tissue.

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.

6th week:
Seminar: Histology of lymphatic organs.

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:
Seminar: Anatomy of head, neck and back.

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.

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.

13th week:
**Lecture:** Neuroendocrine regulation. The hypothalamo-hypophyseal system. The pineal, thyroid, parathyroid and suprarenal glands. The kidney
**Seminar:** Histology of the endocrine system.

14th week:
**Lecture:** The urinary system. Male genital organs
**Seminar:** Anatomy of the urogenital system.

15th week:
**Lecture:** Female genital organs I. Female genital organs II. Development of the urogenital system
**Seminar:** See: practical

**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:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>0 – 59 %</td>
<td>fail (1)</td>
</tr>
<tr>
<td>60 – 69 %</td>
<td>pass (2)</td>
</tr>
<tr>
<td>70 – 79 %</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>80 – 89 %</td>
<td>good (4)</td>
</tr>
<tr>
<td>90 – 100 %</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

Registration for the exam and postponement: Through the NEPTUN system

Reading materials
A. Birinyi: Anatomy

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
CHAPTER 16

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:

<table>
<thead>
<tr>
<th>Final score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 59</td>
<td>fail (1)</td>
</tr>
</tbody>
</table>

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ACADEMIC PROGRAM FOR THE 1ST YEAR

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:

14th week:
Practical: Prescriptions related to the nervous system.
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:

<table>
<thead>
<tr>
<th>Final score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 5</td>
<td>fail (1)</td>
</tr>
<tr>
<td>60-69</td>
<td>pass (2)</td>
</tr>
<tr>
<td>70-79</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>80-89</td>
<td>good (4)</td>
</tr>
<tr>
<td>90-100</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

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:
**Practical:** Seminar: Introduction to genetics. Separation of cell organelles by density gradient centrifugation. DNA, RNA, protein separation techniques.

2nd week:
**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.

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Preparation of metaphase spreads.
**Self Control Test (1st self-control test in extra time.)**

6th week:
**Practical:** Detection of human polymorphism by polymerase chain reaction.

7th week:
**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.)**
CHAPTER 16

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:
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:

<table>
<thead>
<tr>
<th>Percentage (%)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 49.99</td>
<td>fail (1)</td>
</tr>
<tr>
<td>50.00 - 61.99</td>
<td>pass (2)</td>
</tr>
<tr>
<td>62.00 - 69.99</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>70.00 - 79.99</td>
<td>good (4)</td>
</tr>
<tr>
<td>80.00 - 100</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

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%.

<table>
<thead>
<tr>
<th>Average of the 3 tests (%)</th>
<th>Bonus (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.00 - 53.99</td>
<td>1</td>
</tr>
<tr>
<td>54.00 - 57.99</td>
<td>2</td>
</tr>
<tr>
<td>58.00 - 61.99</td>
<td>3</td>
</tr>
<tr>
<td>62.00 - 65.99</td>
<td>4</td>
</tr>
<tr>
<td>66.00 - 69.99</td>
<td>5</td>
</tr>
<tr>
<td>70.00 - 73.99</td>
<td>6</td>
</tr>
<tr>
<td>74.00 - 77.99</td>
<td>7</td>
</tr>
<tr>
<td>78.00 - 81.99</td>
<td>8</td>
</tr>
<tr>
<td>82.00 - 85.99</td>
<td>9</td>
</tr>
<tr>
<td>86.00 - 100</td>
<td>10</td>
</tr>
</tbody>
</table>

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.

Subject: **INORGANIC AND QUALITATIVE ANALYTICAL CHEMISTRY PRACTICE**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Seminar: 15
Practical: 75

1st week:

2nd week:

3rd week:

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- ; HCO3- ; S2- ; SO32- ; SO42- ; PO43- (HPO42- ; H2PO4- ); F- ; BrO3- ; IO3--). Voluntary test: The same as unknown sample, but solution is given.

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...
CHAPTER 16

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⁺; Hg₂⁺; Pb²⁺; Bi(III); Ni²⁺; Co²⁺; 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⁻ (H₂PO₄⁻; HPO₄²⁻); 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:

2nd week:

3rd week:

4th week:

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:
CHAPTER 16

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:

9th week:

10th week:

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:
14th week:

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:

3rd week:
Practical: Isolation of caffeine from tea leaves. Separation of organic compounds with liquid-liquid extraction. Filling in of laboratory notes.

4th week:

5th week:
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:

4th week:
Lecture: Classification of organic reaction. Reaction mechanism. Relationship between structure and physical properties.

5th week:

6th week:
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 substituent 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.
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:

2nd week:

3rd week:

4th week:

5th week:
Lecture: Homogeneous mixtures 1. Ideal and

**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:**


**9th week:**

**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:**

**Seminar:** Electrolysis, practical galvanic cells and corrosion. Electrolysis, decomposition

12th week:

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:

15th week:

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, fluorescence 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: Refractometry P5: Light microscopy 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, radiopharmacons.
**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. Thermodynamics Osmosis
**Seminar:** S2: Biostatistics. Random variable. Cumulative 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 excitability.
**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. Gel electrophoresis, isoelectric focusing, blotting. Detecting molecular interactions (SPR, FCS, FRET)
**Seminar:** Biophysics: Consultation

15th week:
**Lecture:** Consultation. Preparation for the exam.

**Requirements**

**Compulsory reading:**
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 choose 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:

10th week:
Practical: 3. Polymer's relative molecular masses from viscosity measurements.

11th week:

12th week:
Practical: 5. Solubilization.

13th week:

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 Brownian motion, random walk. Diffusion coefficient, average distance. Einstein-Stokes equation. Sedimentation equation. Diffusion flux and diffusion equation. Measuring of size distribution with different techniques (osmosis,

3rd week:

4th week:

5th week:

6th week:

7th week:

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:

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:

<table>
<thead>
<tr>
<th>Final score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 59</td>
<td>fail (1)</td>
</tr>
<tr>
<td>60-69</td>
<td>pass (2)</td>
</tr>
<tr>
<td>70-79</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>80-89</td>
<td>good (4)</td>
</tr>
<tr>
<td>90-100</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

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:
Practical: Kinetic studies on beta-glucosidase from sweet almond.

2nd week:

3rd week:
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:  

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:  

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.
CHAPTER 17

Subject: QUANTITATIVE ANALYTICAL CHEMISTRY THEORY I.
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: 45
Seminar: 15

1st week:

2nd week:

3rd week:
Lecture: Acidimetric and alkaliometric 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.

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.

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.

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:**

**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:**

**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:**

**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:**

**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:
Seminar: Practice, consultation.

15th week:
Lecture: Direct potentiometry. Potentiometric titration Field effect transistors as chemical sensors Conductometry. 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:

4th week:
Practical: Preparation of 1,3-Dinitrobenzene. Preparation of iodoform.

5th week:

6th week:

7th week:

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:

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:

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:
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Week</th>
<th>Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>10th</td>
<td><strong>Structure elucidation of proteins, peptide synthesis. Characterization and structures of carbohydrates, mono-, di- and polysaccharides.</strong></td>
<td>13th</td>
<td><strong>Compounds with porphyrin skeleton. Five-and six-membered ring systems with two or more heteroatoms.</strong></td>
</tr>
<tr>
<td>11th</td>
<td><strong>Reactions of carbohydrates, synthesis of di- and polysaccharides.</strong></td>
<td>14th</td>
<td><strong>Characterization and importance of heterocyclic natural products. Alkaloids. Flavonoids and vitamins.</strong></td>
</tr>
<tr>
<td>12th</td>
<td><strong>Heterocyclic compounds, heteroaromatic systems. Three-, four- and five-membered heterocycles with one heteroatom. ß-lactam antibiotics.</strong></td>
<td>15th</td>
<td><strong>Nucleosides, structures, preparations and transformations of nucleotides and nucleic acids.</strong></td>
</tr>
</tbody>
</table>

### Requirements

Terminal examination, comprehensive examination.

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**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:

<table>
<thead>
<tr>
<th>Week</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td><strong>Introduction, general information and safety training (1 hr).</strong></td>
</tr>
<tr>
<td>2nd</td>
<td><strong>One of the following topics:</strong> Measuring densities by pycnometer, composition of a binary mixture. Measuring electrical conductivity of solutions.</td>
</tr>
<tr>
<td>3rd</td>
<td><strong>One of the following topics:</strong> Measuring the concentration of a coloured solute by spectrophotometry. Determination of NaHCO3 content of a solid sample by gas volumetry.</td>
</tr>
<tr>
<td>4th</td>
<td><strong>One of the following topics:</strong> pH-metric titration curves of hydrochloric and acetic acids. Study of electrolysis.</td>
</tr>
<tr>
<td>5th</td>
<td><strong>One of the following topics:</strong> Mutarotation of glucose measured by polarimetry. Measuring electromotive force of a galvanic cell.</td>
</tr>
<tr>
<td>6th</td>
<td><strong>One of the following topics:</strong> Reaction rate of decomposition of H2O2 measured by gas volumetry. Investigation of buffers.</td>
</tr>
<tr>
<td>7th</td>
<td><strong>One of the following topics:</strong></td>
</tr>
</tbody>
</table>
ACADEMIC PROGRAM FOR THE 2ND YEAR

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 hydrolysis 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
CHAPTER 17

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 Peridermes and lenticels. Studying of Parenchymas and Collenchymas, Salep tuber, Calami Rhysoma, Marrubi herba, Capsici fructus, Cydoniae 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, Ononisradix, 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, Chinas 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 fructus, 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.

Requirements

Detailed information is given in the first practical course.

1st week:  

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 Asteridiae and Pharmaceutically Important Species of the Taxa.

**Requirements**

Detailed information is given in the first lecture.
CHAPTER 17

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:

2nd week:

3rd week:

4th week:

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: allostery, 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:

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:

13th week:

14th week:
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:
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:

<table>
<thead>
<tr>
<th>Final score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 59</td>
<td>fail (1)</td>
</tr>
<tr>
<td>60-69</td>
<td>pass (2)</td>
</tr>
<tr>
<td>70-79</td>
<td>satisfactory (3)</td>
</tr>
<tr>
<td>80-89</td>
<td>good (4)</td>
</tr>
<tr>
<td>90-100</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

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.
CHAPTER 17

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 Quantitative 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). Preparation 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 0.01 mol/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.


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.


17. Bromatometry and iodometry.


19. Gravimetry (theoretical background, practical steps, examples).


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.


27. Theoretical basis of chromatography (types, principles, instrumentation (injection, separation, detection), band spreading, separation efficiency, evaluation of chromatograms).

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY THEORY I.**

Year, Semester: 2nd year/2nd semester

Number of teaching hours:
Lecture: **30**

**1st week:**

**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:**

**4th week:**

**5th week:**

**6th week:**

**7th week:**

**8th week:**

**9th week:**

**10th week:**

**11th week:**

**12th week:**

**13th week:**

**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:


2nd week:

**Practical:** Technical books of pharmacy (European Pharmacopoeia, Formulæ 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 prescription) 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 VII 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.

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.
### 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](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](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:
\[ \text{score for the “A exam”} = \frac{x+y}{2} \]
where
- \( x \) is the average % of the five mid-semester written tests (two in the 1term and three in the 2term)
- \( y \) is the result of the written test completed on the exam

Then, the grade is calculated according to the following table:

<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 59.9 %:</td>
<td>fail</td>
</tr>
<tr>
<td>60 – 69.9 %:</td>
<td>pass</td>
</tr>
<tr>
<td>70 – 79.9 %:</td>
<td>satisfactory</td>
</tr>
<tr>
<td>80 – 89.9 %:</td>
<td>good</td>
</tr>
<tr>
<td>90 – 100.9 %:</td>
<td>excellent</td>
</tr>
</tbody>
</table>

- 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:

2nd week:
Practical: Carbohydrate-containing plant drugs I.

3rd week:
Practical: Carbohydrate-containing plant drugs II.

4th week:
Practical: Fixed oils.
CHAPTER 17

5th week:
Practical: Plant drugs containing organic acids and peptides.

6th week:

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, Purified 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, Oleaner, Strophantus 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:

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 skin. 1 Fingertip skin (HE) 2 Scalp (HE)
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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:

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ACADEMIC PROGRAM FOR THE 3RD YEAR

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: Dialogusok

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:

<table>
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<tr>
<th>Final score</th>
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<td>60-69</td>
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<td>90-100</td>
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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:

5th week:

6th week:
Lecture: 11. Inherited metabolic diseases and their laboratory diagnostics I. 12. Inherited metabolic diseases and their laboratory diagnostics II.

7th week:

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 acute and chronic leukemias and lymphomas I.

Self Control Test

10th week:
Lecture: 19. Laboratory diagnostics of acute and chronic leukemias and lymphomas II. 20. Laboratory diagnostics of acute and chronic leukemias and lymphomas III.


11th week:
Lecture: 21. History of blood transfusion, blood group
CHAPTER 18

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, Li)


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


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:
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 skeleton. Sedatives and hypnotics: alcohols, aldehydes, urethanes, barbiturates and with 4-quinazolone, bezodiazipine and piperidine skeleton.

4th week:
Lecture: Antiepileptic agents (anticonvulsants): compounds with barbiturate, hydantoin, oxazolidin-dione, succinimide and acylurea structure.
Practical: Aminophenazon derivatives, urethan, phentoin.

5th week:
Practical: Selected aromatic compounds: resorcinol, thymol, acetylsalicylic acid etc.

6th week:
Practical: Phenothiazin derivatives; methenamine.

7th week:
Practical: Carbohydrates, ascorbic acid, citric acid.

8th week:
Lecture: Psychopharmacones: anxiolytics (minor tranquilizers): carbamates, benzodiazepines, and diphenylmethane-type compounds. Another anxiolytics.

9th week:

10th week:
Lecture: Antiparkinson agents: piperidylphenyl propanols, diphenyl-methanes, phenothisanes, thioxanthenes.

11th week:
Lecture: Psychostimulants: Analactics.
Phenylethyl amine, piperidine, morpholine and oxazoline derivatives. Anorectic agents.
Psychoenergetic agents: monoamin-oxidase
(MAO) inhibitory compounds, tricyclic antidepressants. Psychomimetics: LSD, psilocibine, 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:

15th week:

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 successfully 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:

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.
CHAPTER 18

9th week:
Practical: General principles and technologies of tablet compression, tablet presses.

10th week:
Practical: Test from tableting

11th week:

12th week:

13th week:

14th week:

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:

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% acetaminophen 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

6th week:
Practical: Course: Prescription, Pharmacy

6th week:
Practical: Course: Prescription, Pharmacy

7th week:

8th week:

9th week:


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

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 suspensions.

13th week:

14th week:

15th week:
Practical: Course: Prescription, Pharmacy
**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

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st week</td>
<td>Pharmaceutical dosage forms: liquid pharmaceutical forms, solutions, stock solutions, aqueous solutions, oily solutions, syrups, aromatic waters, gargles, alcoholic solutions.</td>
</tr>
<tr>
<td>2nd week</td>
<td>Colloid systems. Molecular colloids, association colloids (termotrop and liotrop association colloids). Mucilages, enemas.</td>
</tr>
<tr>
<td>7th week</td>
<td>Tanks for injections, filling and closing. Sterilization. Examination of injections and quality assurance. Stabilization of injections. Special injectable solutions. (injectable suspensions, dry powder, tablets)</td>
</tr>
<tr>
<td>8th week</td>
<td>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.</td>
</tr>
</tbody>
</table>
Exemption of HIV.

10th week:

11th week:

12th week:

13th week:

14th week:

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.
### 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.
ACADEMIC PROGRAM FOR THE 3RD YEAR

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 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:

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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 polymorphism of MHC molecules.  
Practical: Naive and effector T cells. Immunotolerance. The polymorphism of MHC molecules.

6th week:  
Lecture: Antigen-dependent differentiation of B-lymphocytes.  
Practical: Antigen-dependent differentiation of B-lymphocytes.  
Self Control Test

7th week:  

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 intracellular and extracellular pathogens.

10th week:  
Practical: Hypersensitivity 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:  
Practical: Transplantation, immunosupresion 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:
Practical: Laboratory diagnostics of Thrombophilia. Laboratory monitoring of anticoagulant therapy

4th week:
Practical: Laboratory diagnostics of platelet function disorders. Laboratory monitoring of antiplatelet therapy

5th week:
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:
Practical: Serum lipid measurements

10th week:
Lecture: 28. Pathobiochemistry and laboratory diagnostics of cholestasis and cirrhosis. 29. Pathobiochemistry and laboratory diagnostics of the gastrointestinal tract I. 30. Pathobiochemistry and laboratory diagnostics of the gastrointestinal tract II.
Practical: Chromatography, respiratory test
Self Control Test
11th week:
Lecture: 31. Laboratory diagnostics of acute pancreatitis 32. Clinical biochemistry 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 disorders 38. Pathobiochemistry and laboratory diagnostics of adrenal medulla disorders
Practical: Laboratory evaluation of liver and pancreas function

14th week:
Lecture: 40. Laboratory diagnostics of muscle disorders 41. Laboratory diagnostics of bone disorders 42. Demonstration 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:

2nd week:

3rd week:

4th week:

5th week:
CHAPTER 18

6th week:

7th week:

8th week:

9th week:

10th week:

11th week:

12th week:

13th week:

14th week:

15th week:

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

<table>
<thead>
<tr>
<th>Week</th>
<th>Practical Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd week</td>
<td>Sol. pro dialys. perit. I. (Ph.Hg.VII.), Sol. anticoag. “ACD” (Ph.Hg.VII.)</td>
</tr>
<tr>
<td>3rd week</td>
<td>Collins “C” oldat. Kardiostop I. oldat</td>
</tr>
<tr>
<td>4th week</td>
<td>Oculogutt. neomycin. (FoNo.VII.). Oculent. simplex (Ph.Hg.VII.). Oculent. hydrosum (Ph.Hg.VII.). Oculent. neomyc. FoNo VII.</td>
</tr>
<tr>
<td>5th week</td>
<td>Test from infusions and eye preparations.</td>
</tr>
<tr>
<td>6th week</td>
<td>High-shear granulation.</td>
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<tr>
<td>7th week</td>
<td>Fluid bed granulation.</td>
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<tr>
<td>8th week</td>
<td>Hard gelatin capsules, capsule filling and pharmacopoeial tests.</td>
</tr>
<tr>
<td>9th week</td>
<td>Tablet compression, process parameters and tablet qualification.</td>
</tr>
<tr>
<td>10th week</td>
<td>Test from tabletting.</td>
</tr>
<tr>
<td>11th week</td>
<td>Semisolid dosage forms ‘3. Suspension type ointments Pastes. Formulation techniques, equipment.</td>
</tr>
<tr>
<td>13th week</td>
<td>Solid dosage forms ‘2. Suppository formulation in industrial scale. Aims and formulation techniques, equipment.</td>
</tr>
<tr>
<td>14th week</td>
<td>Cosmetics. Aim, possibilities and formulation techniques, equipment.</td>
</tr>
<tr>
<td>15th week</td>
<td>Quality control tests, assessment of practice results.</td>
</tr>
</tbody>
</table>

**Self Control Test**
**1st week:**
**Practical:** Course: Prescription Pharmacy
Introduction, general information. Labour safety, laboratory regulations. Requirements.

**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) (ZnSO4 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. Procainum 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 hydrosom Ph.Hg.VII 20,0g, Oculentum neomycin FoNoVII 10,0g

**5th week:**
**Practical:** Course: Prescription Pharmacy

**6th week:**

**7th week:**

**8th week:**

**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

10th week:

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:

**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:

4th week:
Lecture: Ingredients of tableting and granulation. (Diluents, desintegration agents, binders, adsorption agents, moisture maintain agents, hydro-phylizing 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:

7th week:

8th week:

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:

11th week:

12th week:

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
CHAPTER 18

(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.: fermentation

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 Bioanalytics 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.

2nd week:
Lecture: Morphology and physiology of bacteria. Pathogenesis and infection. Bacterial genetics.

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:
Practical: Immunoserological methods in microbiological diagnosis (precipitation, agglutination, complement fixation, ELISA and western-blot). Molecular diagnostic methods.

5th week:
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:
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.
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.

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:
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:

2nd week:

3rd week:
Lecture: Physical and physicochemical properties of the active agent, distribution coefficients, 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:

5th week:

6th week:

7th week:

8th week:
Lecture: Depot parenteral preparations. Solutions, suspensions, emulsions, implants.

9th week:
Lecture: Therapeutic systems: basic principles.

10th week:

12th week:
Lecture: Veterinary preparations. Veterinary FoNo. Special veterinary drug forms.

13th week:

14th week:

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 aethylenmorphinii chlorati 20 mg/ml. Injectio acidi ascorbici 10%. Injectio procanii 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

<table>
<thead>
<tr>
<th>1st week:</th>
<th>9th week:</th>
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<tbody>
<tr>
<td><strong>Practical</strong>: Introduction to pharmacology.</td>
<td><strong>Practical</strong>: Migraine.</td>
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<tr>
<th>2nd week:</th>
<th>10th week:</th>
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<tbody>
<tr>
<td><strong>Practical</strong>: Receptors and signal transduction.</td>
<td><strong>Practical</strong>: Central and peripheral skeletal muscle relaxants.</td>
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<tr>
<th>3rd week:</th>
<th>11th week:</th>
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<tbody>
<tr>
<td><strong>Practical</strong>: Neurotransmission and neurotransmitters in the CNS.</td>
<td><strong>Practical</strong>: Drugs with important actions on smooth muscle. Local anesthetics.</td>
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<tr>
<th>4th week:</th>
<th>12th week:</th>
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<tbody>
<tr>
<td><strong>Practical</strong>: General anesthetics.</td>
<td><strong>Practical</strong>: Basic pharmacology.</td>
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<th>5th week:</th>
<th>13th week:</th>
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<tr>
<td><strong>Practical</strong>: Sedatohypnotics. Antidepressants and lithium. Antipsychotics.</td>
<td><strong>Practical</strong>: Cholinerg-activating and cholinoreceptor-blocking drugs.</td>
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<tr>
<th>6th week:</th>
<th>14th week:</th>
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<tbody>
<tr>
<td><strong>Practical</strong>: Antiepileptics.</td>
<td><strong>Practical</strong>: Adrenoceptor-activating and blocking drugs.</td>
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<tr>
<th>7th week:</th>
<th>15th week:</th>
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<tbody>
<tr>
<td><strong>Practical</strong>: Pharmacologic management of Parkinsonism.</td>
<td><strong>Practical</strong>: General consultation on the curriculum of the first semester</td>
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<th>8th week:</th>
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<tbody>
<tr>
<td><strong>Practical</strong>: Drugs used in Alzheimer’s Disease.</td>
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**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 (AWS) 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

2nd week:
Lecture: 3. Air pollution and health 4. Water pollution and health
Seminar: 3-4. Demographic methods to study the health status of the population

3rd week:
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:
Seminar: 11-12. Mercury toxicity, case study

7th week:
Seminar: 13-14. Health promotion

8th week:
Lecture: 15. Epidemiology of respiratory diseases 16. Epidemiology of skeletal and dental diseases I
Seminar: 15-16. Health education

9th week:
Lecture: 17. Public health problems of disadvantaged people 18. Introduction into the general epidemiology of non-communicable
CHAPTER 19

diseases
Seminar: 17-18. Epidemiological measures

10th week:
Lecture: 19. Epidemiology of neoplastic diseases
20. Epidemiology of cardiovascular diseases
Seminar: 19-20. Epidemiological studies

11th week:
Lecture: 21. Epidemiology of skeletal and dental diseases II
22. General epidemiology of communicable diseases
Seminar: 21-22. Preventive strategies

12th week:
Lecture: 23. Epidemiology of respiratory infectious diseases
24. Infection control and pharmacy

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 hepatitis
28. Health policy principles

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.

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**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: Immunoanalytical 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:

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  
**Lecture:** 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.

Obsence 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, emphysema. 4. Pulmonary tumour. 5. Type I, II diabetes mellitus and its treatment.

2nd week:  

3rd week:  

4th week:  

5th week:

6th week:

7th week:

8th week:

9th week:

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, PSYCHIATRY. 51. Epilepsy. 52. 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:

15th week:

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.

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: Antihelminthic 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 consumption 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:

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%.
# CHAPTER 19

## Department of Pharmaceutical Technology

Subject: **INDUSTRIAL PHARMACEUTICAL TECHNOLOGY**  
Year, Semester: 4th year/2nd semester  
Number of teaching hours:  
Lecture: **30**  
Seminar: **15**

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Lecture</th>
<th>Lecture</th>
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</thead>
<tbody>
<tr>
<td>1st</td>
<td>Treatment of working atmospheres. Filtration of working atmospheres</td>
<td>9th</td>
<td>Liquid Forms I. Content of liquid forms</td>
</tr>
<tr>
<td>2nd</td>
<td>Iso-technology</td>
<td>10th</td>
<td>Materials of containers for liquid forms</td>
</tr>
<tr>
<td>3rd</td>
<td>Dissolution. Lyophilization</td>
<td>11th</td>
<td>Liquid Forms II. Preparation of liquid forms</td>
</tr>
<tr>
<td>4th</td>
<td>Filtration of liquids. Sterilization</td>
<td>12th</td>
<td>Filling of liquid forms. Design of production plants</td>
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<tr>
<td>5th</td>
<td>Solid Forms I. Mixing process</td>
<td>13th</td>
<td>Semi-Solid Forms II. Transdermal systems</td>
</tr>
<tr>
<td>6th</td>
<td>Solid Forms II: Conversion into dosage form.</td>
<td>14th</td>
<td>Suppositories</td>
</tr>
<tr>
<td>7th</td>
<td>Semi-Solid Forms I. Soft gelatin capsules</td>
<td>15th</td>
<td>consultation</td>
</tr>
<tr>
<td>8th</td>
<td>Packaging</td>
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</tbody>
</table>

## 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:** 1st control test NMR and ESR: Basics and application in the pharmaceutical research and clinical diagnosis.
**Practical:** Isolation of nucleic acids, agarose gel electrophoresis.

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**
CHAPTER 19

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:

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:

11th week:
Practical: Histamine and antihistaminic drugs. Serotonin, agonists and antagonists.

12th week:

13th week:
Practical: Immunpharmacology

14th week:
Practical: Cancer chemotherapy

15th week:
Practical: General consultation on the curriculum of the second semester

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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:

10th week:

11th week:
Lecture: Pharmacology of the inflammation, steroid and non-steroid anti-inflammatory drugs, the ergot alkaloids. Pharmacotherapy of rheumatoid arthritis.
12th week:

13th week:
Lecture: Immunopharmacology

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) beneficence; (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.

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ethic 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:

9th week:
Lecture: The ethical aspects of medical experiments of non-human animals. The possibility 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

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Fundamentals to biopharmacy.</td>
<td>Basic pharmacokinetic parameters.</td>
</tr>
<tr>
<td>3rd</td>
<td>Liberation, absorption, distribution, metabolism, elimination, response.</td>
<td>One-compartment open model.</td>
</tr>
<tr>
<td>4th</td>
<td>Drug release from the delivery system, bioavailability of the drug at the absorption site.</td>
<td>Continuous and intermittent drug delivery.</td>
</tr>
<tr>
<td>5th</td>
<td>Drug clearance, hepatic drug elimination, renal drug elimination.</td>
<td>Equations, pharmacokinetic calculations.</td>
</tr>
<tr>
<td>6th</td>
<td>Drug transport. Active and passive transport.</td>
<td>Equations, pharmacokinetic calculations II.</td>
</tr>
<tr>
<td>7th</td>
<td>Type of drug delivery systems.</td>
<td>Equations, pharmacokinetic calculations III.</td>
</tr>
<tr>
<td>8th</td>
<td>Biopharmacy of tables and capsules.</td>
<td>Equations, pharmacokinetic calculations IV.</td>
</tr>
<tr>
<td>9th</td>
<td>Oral controlled release.</td>
<td>Equations, pharmacokinetic calculations V.</td>
</tr>
<tr>
<td>10th</td>
<td>Delivering drugs by inhalation.</td>
<td>Equations, pharmacokinetic calculations VI.</td>
</tr>
<tr>
<td>11th</td>
<td>Transdermal system.</td>
<td>Equations, pharmacokinetic calculations VII.</td>
</tr>
<tr>
<td>12th</td>
<td>Time-programmed and patient-controlled drug delivery.</td>
<td>Equations, pharmacokinetic calculations VIII.</td>
</tr>
<tr>
<td>13th</td>
<td>Smart drug delivery system and targeted therapy.</td>
<td>Equations, pharmacokinetic calculations IX.</td>
</tr>
<tr>
<td>14th</td>
<td>Pharmaceutical biotechnology.</td>
<td>End of semester control test</td>
</tr>
</tbody>
</table>
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. Observe 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

<table>
<thead>
<tr>
<th>1st week:</th>
<th>9th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Pharmaceutical care (history, subject, theory, basic)</td>
<td><strong>Lecture:</strong> Nutrition, diet and pharm. care I (theory, BMI, calculations, prevention, nutrition piramid)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2nd week:</th>
<th>10th week:</th>
</tr>
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<tbody>
<tr>
<td><strong>Lecture:</strong> Medication therapy management (subject, concept, theory)</td>
<td><strong>Lecture:</strong> Nutrition, diet and pharm. care II (special diet and nutrition, special diet in metabolic syndrome and in oncology patients)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3rd week:</th>
<th>11th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> International pharmaceutical care protocols</td>
<td><strong>Lecture:</strong> Pharmaceutical care and it’s limitation (in cold, cough, flu, upper respiratory problems, fever, sunburn etc.)</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>4th week:</th>
<th>12th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Pharmaceutical care in Metabolic Syndrome</td>
<td><strong>Lecture:</strong> Asthma, COPD and special inhalation medication.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5th week:</th>
<th>13th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Diabetes prevention and pharm. care</td>
<td><strong>Lecture:</strong> Pharmaceutical care in reflux problems, heart burn, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6th week:</th>
<th>14th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Dyslipidemia and hypertension</td>
<td><strong>Lecture:</strong> Pharm. care in hemostasis (coagulation, measurement etc.)</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>7th week:</th>
<th>15th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Practice and theory of cholesterol, glucose, INR, and blood pressure measurement I.</td>
<td><strong>Lecture:</strong> Consultation</td>
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<thead>
<tr>
<th>8th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong> Practice and theory of cholesterol, glucose, INR, and blood pressure measurement II.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>9th week:</th>
<th>10th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Nutrition, diet and pharm. care I (theory, BMI, calculations, prevention, nutrition piramid)</td>
<td><strong>Lecture:</strong> Nutrition, diet and pharm. care II (special diet and nutrition, special diet in metabolic syndrome and in oncology patients)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11th week:</th>
<th>12th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Pharmaceutical care and it’s limitation (in cold, cough, flu, upper respiratory problems, fever, sunburn etc.)</td>
<td><strong>Lecture:</strong> Asthma, COPD and special inhalation medication.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>13th week:</th>
<th>14th week:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Pharmaceutical care in reflux problems, heart burn, etc.</td>
<td><strong>Lecture:</strong> Pharm. care in hemostasis (coagulation, measurement etc.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15th week:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong> Consultation</td>
<td></td>
</tr>
</tbody>
</table>
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:

9th week:

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 generators and applications.

7th week:
Lecture: Preparation of radiopharmaceuticals used in nuclear medicine, quality assurance, 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, Tl-201).

15th week:

Requirements


Radioactive tracers: types of radiations, radioisotope preparations, decay rows, generator systems, GMP productions. The Mo-99/Tc-99m generator and other generators.


(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:

2nd week:
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

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Seminar</th>
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</thead>
<tbody>
<tr>
<td>2nd week</td>
<td>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.</td>
<td>Adverse drug events, side effects I.</td>
</tr>
<tr>
<td>3rd week</td>
<td>The role of clinical pharmacist in a patient treatment.</td>
<td>Adverse drug events, side effects II.</td>
</tr>
<tr>
<td>4th week</td>
<td>Therapeutic drug monitoring.</td>
<td>Adverse drug events, side effects III.</td>
</tr>
<tr>
<td>6th week</td>
<td>Clinical nutrition. Enteric and parenteric nutrition. Total parenteric nutrition. Parenteric nutritive infusions, fat emulsions. &quot;All in one&quot; mixtures.</td>
<td>Adverse drug events, side effects V.</td>
</tr>
<tr>
<td>7th week</td>
<td>Compliance, non-compliance. Pharmaceutical Care.</td>
<td>Pharmaceutical care I.</td>
</tr>
<tr>
<td>8th week</td>
<td>Evidence based medicine.</td>
<td>Pharmaceutical care II.</td>
</tr>
<tr>
<td>9th week</td>
<td>Pharmacovigilance</td>
<td>Pharmaceutical care III.</td>
</tr>
<tr>
<td>10th week</td>
<td>Wound management</td>
<td>Pharmaceutical care IV.</td>
</tr>
<tr>
<td>11th week</td>
<td>Quality assurance in Health Care System</td>
<td>Pharmaceutical care V.</td>
</tr>
</tbody>
</table>
Seminar: On ward visiting I.

13th week:
Lecture: Infection control, prevention and surveillance
Seminar: On ward visiting II.

14th week:

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:

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.

8th week:
Lecture: CNS drugs and interactions I.

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.
CHAPTER 20

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

<table>
<thead>
<tr>
<th>1st week:</th>
<th>8th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong></td>
<td><strong>Lecture:</strong></td>
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<tr>
<td></td>
<td>Illness as crisis. Chronic illness, hospitalisation.</td>
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<table>
<thead>
<tr>
<th>2nd week:</th>
<th>9th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong></td>
<td><strong>Lecture:</strong></td>
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<tr>
<td></td>
<td>The placebo effect</td>
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<thead>
<tr>
<th>3rd week:</th>
<th>10th week:</th>
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</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong></td>
<td><strong>Lecture:</strong></td>
</tr>
<tr>
<td>Basics of communication. Communication with handicapped people</td>
<td>The psychology of pain.</td>
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<tr>
<th>4th week:</th>
<th>11th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong></td>
<td><strong>Lecture:</strong></td>
</tr>
<tr>
<td>Communication with elderly people</td>
<td>Change in health behavior. Stages of change, the Prochaska-DiClemente model.</td>
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<thead>
<tr>
<th>5th week:</th>
<th>12th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong></td>
<td><strong>Lecture:</strong></td>
</tr>
<tr>
<td>Stress, coping, psychological immune system</td>
<td>Body image disorders and eating disorders.</td>
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<tr>
<th>6th week:</th>
<th>13th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong></td>
<td><strong>Lecture:</strong></td>
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<thead>
<tr>
<th>7th week:</th>
<th>14th week:</th>
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</thead>
<tbody>
<tr>
<td><strong>Lecture:</strong></td>
<td><strong>Lecture:</strong></td>
</tr>
<tr>
<td>Illness behaviors: definition, the experience of illness, patient role. Representations and benefits of illness. Illness cognitions</td>
<td>Mood disorders and psychotic disorders. Symptoms, prevalence relevance and compliance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15th week:</th>
<th><strong>Lecture:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam</td>
<td></td>
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</table>

**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


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 immundeffects

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
Extra Exemption test appointments ONLY for students with late registration!
<table>
<thead>
<tr>
<th>Week</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd week:</td>
<td>Word processor programs, MS Word II.</td>
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<tr>
<td>4th week:</td>
<td>Word processor programs, MS Word III.</td>
</tr>
<tr>
<td>5th week:</td>
<td>Spreadsheets programs, MS Excel I. 1. Entering data (difference b/w text &amp; 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))</td>
</tr>
<tr>
<td>6th week:</td>
<td>Spreadsheets programs, MS Excel II.</td>
</tr>
<tr>
<td>7th week:</td>
<td>Spreadsheets programs, MS Excel III.</td>
</tr>
<tr>
<td>8th week:</td>
<td>Spreadsheets programs, MS Excel IV.</td>
</tr>
<tr>
<td>10th week:</td>
<td>Fundamentals and basic concepts of informatics.</td>
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<tr>
<td>11th week:</td>
<td>Logical and physical realization of networks.</td>
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<tr>
<td>12th week:</td>
<td>Internet.</td>
</tr>
<tr>
<td>13th week:</td>
<td>Summary.</td>
</tr>
<tr>
<td>14th week:</td>
<td>Test I.</td>
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<tr>
<td>15th week:</td>
<td>Test II.</td>
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</table>

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% = grade 1 (fail)
61%-70% = grade 2 (pass)
71% - 80% = grade 3 (satisfactory)
81% - 90% = grade 4 (good)
91% = grade 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!!!
CHAPTER 21

the cell membrane. Fluorescence conjugation of biomolecules, techniques based on fluorescence polarization and fluorescence resonance energy transfer.

5th week:

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:

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:

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 modern 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.
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.
CHAPTER 21

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:

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.
**REQUIRED ELECTIVE COURSES**

<table>
<thead>
<tr>
<th>4th week:</th>
<th>Lecture: The trends on inflation and unemployment rate. Decisions of fiscal and monetary politics.</th>
<th>7th week:</th>
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<td>Seminar: Elements of a Business plan and C/F plans.</td>
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<tr>
<th>5th week:</th>
<th>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.</th>
<th>8th week:</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Seminar: Calculations of an investment, plan for business development, expected revenue and return of investment in a Business plan and C/F in practice.</td>
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<thead>
<tr>
<th>6th week:</th>
<th>Lecture: The operation, financial aspects of a pharmacy as a business unit. Revenue, costs and cash/flow.</th>
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</table>

**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**  

<table>
<thead>
<tr>
<th>1st week:</th>
<th>Lecture: Introduction to Pharmacoepidemiology: The new concept and definitions, Study design, methodology; Kay parameters in epidemiology; Sample size, bias, confounding analysis.</th>
<th>4th week:</th>
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<tr>
<td></td>
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<td>Lecture: The analysis of “real life” data, assessments and trends based on big-datasets, by population</td>
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<tr>
<th>2nd week:</th>
<th>Lecture: Drug utilization studies. Classification of outcome and exposure, Database and Data mining in practice.</th>
<th>5th week:</th>
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<td>Lecture: Systematic literature review, Methodology of a metaanalysis.</td>
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<tr>
<th>3rd week:</th>
<th>Lecture: Measures of association, Population Attributable Risk</th>
<th>6th week:</th>
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<tr>
<td></td>
<td></td>
<td>Seminar: Practice of selected methodology</td>
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### 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. Written 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:

<table>
<thead>
<tr>
<th>Lecture</th>
<th>15</th>
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</thead>
</table>

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:
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.
**REQUIRED ELECTIVE COURSES**

**Subject: JURISTIC KNOWLEDGE FOR PHARMACISTS**  
**Year, Semester:** 5th year/1st semester  
**Number of teaching hours:** Lecture: 14

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1st</td>
<td><strong>Lecture:</strong> Introduction to Law – Norms, Mores and Folkways, Defining Law</td>
<td>Star Pharmacist</td>
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<tr>
<td>2nd</td>
<td><strong>Lecture:</strong> Families of Law, Functions of Law, Classification of Law</td>
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<tr>
<td>3rd</td>
<td><strong>Lecture:</strong> Sources of Law, Principles for resolve conflicts of Law</td>
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<tr>
<td>4th</td>
<td><strong>Lecture:</strong> Interpretation of Law, Dispute resolution</td>
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<td>5th</td>
<td><strong>Lecture:</strong> Law and Ethics in Pharmacy I. – The rights of the patient</td>
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<td>6th</td>
<td><strong>Lecture:</strong> Law and Ethics in Pharmacy II. – Moral principles in medical practice, Ethical Codes for Pharmacists</td>
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<tr>
<td>7th</td>
<td><strong>Lecture:</strong> Health and Pharmaceutical Care, The 7 Star Pharmacist</td>
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<td>8th</td>
<td><strong>Lecture:</strong> The Good Pharmacy Practice</td>
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<td>9th</td>
<td><strong>Lecture:</strong> Pharmaceutical Legislation</td>
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<td>10th</td>
<td><strong>Lecture:</strong> International Health Organisations</td>
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<td>11th</td>
<td><strong>Lecture:</strong> Global Health Law I.</td>
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<td>12th</td>
<td><strong>Lecture:</strong> Global Health Law II.</td>
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<td>13th</td>
<td><strong>Lecture:</strong> Case Studies (Patient Rights, Ethics)</td>
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<td>14th</td>
<td><strong>Lecture:</strong> consultation</td>
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<tr>
<td>15th</td>
<td><strong>Lecture:</strong> consultation</td>
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**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

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1st</td>
<td><strong>Lecture:</strong> Introduction. Nanotechnology and Nanomedicine</td>
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## CHAPTER 21

<table>
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<tr>
<th>2nd week:</th>
<th>9th week:</th>
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<th>3rd week:</th>
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<th>7th week:</th>
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<th>8th week:</th>
<th>15th week:</th>
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### Requirements

Written test

Subject: **OPERATING SYSTEM OF THE PHARMACEUTICAL INDUSTRY**

Year, Semester: 5th year/1st semester

Number of teaching hours:

Lecture: 15

<table>
<thead>
<tr>
<th>1st week:</th>
<th>4th week:</th>
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<tbody>
<tr>
<td>Lecture: Pharmaceutical quality system I.</td>
<td>Lecture: Pharmaceutical industry and patent systems II.</td>
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<tr>
<th>2nd week:</th>
<th>5th week:</th>
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<tr>
<td>Lecture: Pharmaceutical quality system II.</td>
<td>Lecture: CGMPS and the concepts of modern quality systems I.</td>
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<tr>
<th>3rd week:</th>
<th>6th week:</th>
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<tbody>
<tr>
<td>Lecture: Pharmaceutical industry and patent systems I.</td>
<td>Lecture: CGMPS and the concepts of modern</td>
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</table>
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.
CHAPTER 21

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, nomenclature. 3. Reading of

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.
REQUIRED ELECTIVE COURSES


3rd week:
**Lecture:** 6. Simple processes of pharmaceutical technology (measuring, sieving, mixing of powders, dilution, concentration calculation of solutions, other simple calculations needed for pharmaceutical 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

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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**
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.

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• The legal possibilities of changing the original prescription
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  application, administration, shelf-life)
• Documentation of preparation, and administrative obligations
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• 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
Subject: **STATE EXAM PRACTICE II. PHARMACY DISPENSING**  
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
REQUIRED ELECTIVE COURSES

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**

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<thead>
<tr>
<th>1st week:</th>
<th>10th week:</th>
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<tr>
<td>Lecture: Basics of veterinary hygiene I.</td>
<td>Lecture: Veterinary illness and therapy II.</td>
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<th>2nd week:</th>
<th>11th week:</th>
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<tr>
<td>Lecture: Basics of veterinary hygiene II.</td>
<td>Lecture: Veterinary illness and therapy III.</td>
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<th>3rd week:</th>
<th>12th week:</th>
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<tr>
<td>Lecture: Basics of veterinary hygiene III.</td>
<td>Lecture: Test</td>
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<th>4th week:</th>
<th>13th week:</th>
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<tbody>
<tr>
<td>Lecture: Basics of veterinary hygiene IV.</td>
<td>Lecture: Zoonisis-animal diseases transmissible to humans</td>
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<th>5th week:</th>
<th>14th week:</th>
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<tbody>
<tr>
<td>Lecture: Formule Normales Veterinariae III</td>
<td>Lecture: Zoonisis-animal diseases transmissible to humans II.</td>
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<th>6th week:</th>
<th>15th week:</th>
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<tbody>
<tr>
<td>Lecture: Preparations from Formule Normales Veterinariae III</td>
<td>Lecture: Consultation</td>
</tr>
</tbody>
</table>

| 9th week: |  |
|-----------||
| Lecture: Veterinary illness and therapy I. | |

**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.
CHAPTER 21

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**


5th week: Lecture: Computational chemistry. Polymorph prediction.


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.

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REQUIRED ELECTIVE COURSES

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

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](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](http://phys.dote.hu)
The lectures are listed at the web site of the Department of Physiology

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:

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<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tr>
<td>0-39.9%</td>
<td>Failed</td>
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<td>40-54.9</td>
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<td>55-69.9%</td>
<td>Satisfactory</td>
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<tr>
<td>70-84.9%</td>
<td>Good</td>
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<tr>
<td>85-100%</td>
<td>Excellent</td>
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### Division of Emergency Medicine

**Subject:** FIRST AID AND REANIMATION  
**Year, Semester:** 1st year/2nd semester  
**Number of teaching hours:**  
Lecture: 7  
Practical: 8

<table>
<thead>
<tr>
<th>1st week:</th>
<th>9th week:</th>
<th>10th week:</th>
<th>11th week:</th>
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<th>13th week:</th>
<th>14th week:</th>
<th>15th week:</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong> Definition of “first aid”; first aid levels; time factor; behavior of first responder in the field; the emergency call</td>
<td><strong>Practical:</strong> CPR training, two-rescuer method (two hours)</td>
<td><strong>Practical:</strong> 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)</td>
<td><strong>Practical:</strong> Bandages for head, nose; ears, eyes; chin, body and extremities; practicing the bandages (two hours)</td>
<td><strong>Practical:</strong> 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)</td>
<td><strong>Practical:</strong> CPR training (two hours)</td>
<td><strong>Self Control Test</strong></td>
<td><strong>Lecture:</strong> Intoxication; guideline of poisoning in toxicology; typical intoxications, special signs, first aid</td>
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<td><strong>2nd week:</strong></td>
<td><strong>Lecture:</strong> Unconsciousness; airway obstruction; airway opening maneuvers.</td>
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<td><strong>3rd week:</strong></td>
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<td><strong>Lecture:</strong> 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</td>
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<td><strong>Lecture:</strong> Reanimation on the spot – organization problems; the theory of CPR; complications during the CPR; effect, results and success during CPR</td>
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<td><strong>Lecture:</strong> Examination of breathing and circulation; the chest-thrust; airway opening maneuvers; the recovery position (Gábor maneuver); one hour</td>
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<td><strong>Practical:</strong> Practicing the ventilation (one hour)</td>
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<td><strong>Practical:</strong> Practicing the chest compression (one hour)</td>
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<td><strong>Practical:</strong> CPR training without equipment (two hours)</td>
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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:
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:
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:

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7th week:
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.

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
Tutor: Miklós Antal M.D., Ph.D., D.Sc.

2. Title: Molecular organization of the endogenous cannabinoid signaling apparatus in the superficial spinal dorsal horn in health and disease
Tutor: Klára Matesz M.D., Ph.D., D.Sc.

3. Title: Role of the extracellular matrix in the plasticity of the vestibular system.
Tutor: Klára Matesz M.D., Ph.D., D.Sc.

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 excitatory cortico-cortical input in the primary visual cortex

8. Title: Functional mapping of callosal inputs on the dendritic arbour of neurons in the visual cortex


10. Title: Synaptic mapping of identified excitatory and inhibitory neurons in the primary visual cortex. Immun-electron microscopic study.

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.
Supervisor: 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
Tutor: László Fésüs M.D., Ph.D., D.Sc., M.H.A.Sc.

2. Title: Development of effective recombinant tissue transglutaminase production systems. Development of assays to test transglutaminase activity. Studying superGTPase tissue transglaminases.
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.
Tutor: László Fésüs M.D., Ph.D., D.Sc., M.H.A.Sc.

4. Title: Investigation of the phagocytosis of apoptotic cells
Tutor: László Fésüs M.D., Ph.D., D.Sc., M.H.A.Sc.

5. Title: The anti-inflammatory role of adenosine A2A receptor.
Tutor: Zsuzsa Szondy M.D., Ph.D., D.Sc.

6. Title: The anti-inflammatory role of membrane-bound TNFalpha
Tutor: Zsuzsa Szondy M.D., Ph.D., D.Sc.

7. Title: The potential role of LXR receptor in the dexamethasone-induced phagocytosis of apoptotic cells.
Tutor: Zsuzsa Szondy M.D., Ph.D., D.Sc.

8. Title: The role of adenosine A3 receptor in mediating anti-inflammatory action of apoptotic cells.
Tutor: Zsuzsa Szondy M.D., Ph.D., D.Sc.

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.

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**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 trastuzumab 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: Zsofia 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.

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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 microscopy 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.
   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 Kömöves 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 catalysis 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 bioprosthesis 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)

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 diabetes 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: Supraventricular 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

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

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.

5. Title: Human disease models in animals and lower eukaryotes (review).
   Tutor: Zsigmond Fehér M.D., Ph.D.
<table>
<thead>
<tr>
<th>Title</th>
<th>Tutor</th>
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<tbody>
<tr>
<td>Ca++-binding proteins in Streptomyces</td>
<td>András Penyige M.Sc., Ph.D.</td>
</tr>
<tr>
<td>Isolation of mono-ADP-ribosylated proteins from pro- and eukaryotic cells</td>
<td>Zsuzsanna Birkó M.Sc., Ph.D.</td>
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<tr>
<td>Analysis of an A factor non-producer bald mutant Streptomyces griseus strain with respect of antibiotic production and cell differentiation</td>
<td>Zsuzsanna Birkó M.Sc., Ph.D.</td>
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<tr>
<td>Chromosome-tracking studies in complex diseases</td>
<td>György Vargha M.D., Ph.D.</td>
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<tr>
<td>Factor-C: a protein regulating differentiation in Streptomyces</td>
<td>Judit Keserű M.Sc., Ph.D.</td>
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<tr>
<td>Copy number variation of WT-1 gene in hematological conditions</td>
<td>Gergely Buglyó M.D., Ph.D.</td>
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<tr>
<td>Functional analysis of the Streptomyces facC gene in Aspergillus</td>
<td>Melinda Paholcsek M.Sc., Ph.D.</td>
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<td>Global analysis of the human blood plasma epitome and interactome in health and disease</td>
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<td>Use of comparative monoclonal antibody proteomics to detect three dimensional conservation relevant to protein function</td>
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<td>Altered differentiation of monocyte derived dendritic cells and their functional differences</td>
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<tr>
<td>Study of antibiotic production and differentiation in Streptomyces bacteria</td>
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<tr>
<td>Study of the role of miRNAs in oncogenic disorders</td>
<td>Melinda Szilágyi-Bónizs M.Sc., Ph.D.</td>
</tr>
<tr>
<td>Relationship between exercise and development of malignant tumors</td>
<td>Balázs Juhász M.D.</td>
</tr>
<tr>
<td>Role of miRNAs in development of breast cancer</td>
<td>Éva Szekanecz M.D., Ph.D.</td>
</tr>
</tbody>
</table>
CHAPTER 22

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.
   Tutor: János Kappelmayer M.D., Ph.D., D.Sc.
2. Title: The effect of thrombotic and inflammatory 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 peripheral 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 of 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 venous leg ulcer
   Tutor: Zoltán Péter M.D.

15. Title: Biological therapy in psoriasis - mechanism of action and reasons for secondary loss of response
16. Title: New approaches in the classification and therapy of chronic urticaria
17. Title: Possibility of allergen specific immunotherapy 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

2. Title: Interaction of protein phosphatase 1 catalytic subunit with regulatory proteins

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 Csoros 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 targeting 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: Prevalence 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.

    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
<table>
<thead>
<tr>
<th>Title</th>
<th>Tutor</th>
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<tr>
<td>22. Title: The presence of antiphospholipide antibodies in the disease course of the MCTD</td>
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<tr>
<td>23. Title: Vascular involvement in mixed connective tissue disease.</td>
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<td>24. Title: Vascular risk factors in undifferentiated connective tissue disease</td>
<td>Tutor: Edit Bodolay M.D., Ph.D., D.Sc.</td>
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<tr>
<td>25. Title: Dermato/polymyositis overlap with antiphospholipide syndrome.</td>
<td>Tutor: Katalin Dankó M.D., Ph.D., D.Sc.</td>
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<tr>
<td>26. Title: Genetical study in myositis</td>
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<tr>
<td>27. Title: Improvement of quality of life in polymyositis and dermatomyositis patients by physiotherapy</td>
<td>Tutor: Katalin Dankó M.D., Ph.D., D.Sc.</td>
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<tr>
<td>28. Title: Plasmapheresis treatment in intensive therapy</td>
<td>Tutor: Pál Soltész M.D., Ph.D., D.Sc.</td>
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<tr>
<td>29. Title: Autoimmune disorders and GI tract</td>
<td>Tutor: Zsolt Barta M.D., Ph.D.</td>
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<td>30. Title: Ischemic colitis.</td>
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<td>31. Title: Life quality of Raynaud syndrome</td>
<td>Tutor: Zoltán Csiki M.D., Ph.D.</td>
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<td>32. Title: The disease course after stent implantation in peripheral arterial disease</td>
<td>Tutor: György Kerekes M.D., Ph.D.</td>
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<tr>
<td>33. Title: Novel therapeutical approaches in multiple myeloma</td>
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<tr>
<td>34. Title: The impact of multi-drug resistance genes in the prognosis of lymphoproliferative disorders</td>
<td>Tutor: László Váróczy M.D., Ph.D.</td>
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<td>35. Title: Inherited and acquired thrombophilia</td>
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<td>36. Title: New direct oral anticoagulants</td>
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<td>37. Title: Stem cell therapy in peripheral arterial disorders</td>
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<td>Tutor: István Altorjay M.D., Ph.D.</td>
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<td>43. Title: Langerhans histiocytosis</td>
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<td>45. Title: Therapeutic challenges in rare haemostatic disorders</td>
<td>Tutor: György Pfliegler M.D., Ph.D.</td>
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<td>46. Title: Epidemiology, diagnostics and therapy of chronic hepatitis C</td>
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<td>49. Title: Therapeutic options in primary sclerotizing cholangitis</td>
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<tr>
<td>50. Title: Treatment of autoimmune hepatitis</td>
<td>Tutor: István Tornai M.D., Ph.D.</td>
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<tr>
<td>51. Title: A case history of an interesting acute myeloid leukaemia patient in the 2nd Department of Medicine (connection with the literature data)</td>
<td>Tutor: Ágota Schlammadinger M.D., Ph.D.</td>
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<tr>
<td>52. Title: Chronic neutrophilic leukaemia</td>
<td>Tutor: Béla Telek M.D., Ph.D.</td>
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<td>53. Title: Therapeutic options of CML</td>
<td>Tutor: László Rejtő M.D., Ph.D.</td>
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<td>54. Title: Biological treatment of ulcerative colitis</td>
<td>Tutor: Károly Palatka M.D., Ph.D.</td>
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<td>55. Title: The role of Willebrand factor in various internal diseases.</td>
<td>Tutor: Ágota Schlammadinger M.D., Ph.D.</td>
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<td>56. Title: Bacterial infection in liver cirrhosis</td>
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<td>57. Title: Current therapeutic options of acute pancreatitis</td>
<td>Tutor: Zsuzsa Vitális M.D., Ph.D.</td>
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<td>58. Title: Diagnosis and treatment of chronic lymphocytic leukemia</td>
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<td>59. Title: Novel therapeutic approaches in the treatment of multiple myeloma</td>
<td>Tutor: Zsuzsa Vitális M.D., Ph.D.</td>
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<td>60. Title: Philadelphia negative chronic</td>
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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 (HD1): 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: Ágnes Cseppentő M.D.

21. Title: Optional title in pharmacology
TITLES OF THESES

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 Bánya 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

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

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    Tutor: István Tornai M.D., Ph.D.

11. Title: Biological treatment of ulcerative cholitis
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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
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 neoplasms - 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.

    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 consequences in sleep apnea.  
9. Title: Obesity and sleep apnea.  
   Tutor: Tünde Magyar M.D., Ph.D.

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**Department of Neurosurgery**

1. Title: Comparison of cerebral vasospasm 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
   Tutor: Attila Jakab M.D., Ph.D.

29. Title: Ultrasound dating in pregnancy
   Tutor: Alpár Gábor Juhász 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
   Tutor: Zoárd Krasznai M.D., Ph.D.

32. Title: New treatment strategies in ovarian cancer
   Tutor: Péter Török 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.

**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 cytokine 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: Morphologic changes in glaucoma  
Tutor: Adrienne Csutak M.D., Ph.D.

17. Title: Corneal measurements 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 Rybalovszki M.D.

Department of Pediatrics  
1. Title: Contemporary evaluation 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 Mogyorós 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.
CHAPTER 22

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: Žsuzsanna 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 inflammation in psychiatric disorders
7. Title: Post-traumatic stress disorder and post-traumatic growth.
8. Title: The neurobiology of depression.
9. Title: The role of microbiota in mental health
10. Title: The therapeutic potentials of psychodelics
    Tutor: Ede Frecska M.D., M.A., Ph.D.

Department of Pulmonology
   Tutor: Andrea Fodor M.D.

2. Title: New perspectives in the treatment of community acquired 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: Histopathzto 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 hyperparathyroidism  
   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 pelvo-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 orchidopexy 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.  

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 Vecseryénys 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 Carbopol 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.
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.
(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,
WRITING AND DEFENDING A THESIS

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Title</th>
<th>Author(s)</th>
<th>Edition</th>
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**SBMC**

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<th>Edition</th>
<th>Publisher</th>
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<tbody>
<tr>
<td>Introduction to Biophysics:</td>
<td>Serway/Vuille: College Physics.</td>
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</tbody>
</table>
Essential Cell Biology.

**Latin Language I.:**
Takácsné Tóth Emőke: Latin for Pharmacy Students.

**Computer Science:**
Greg Perry: Microsoft Office.

**Hungarian Language I/1.:**
Győrffy Erzsébet, Ph.D.: Hogy s mint? I.
2013.

**Latin Language II.:**
Takácsné Tóth Emőke: Latin for Pharmacy Students II.

**Inorganic and Qualitative Analytical Chemistry Theory:**
G. Svehla (reviser): Vogel's qualitative inorganic analysis.
N. N. Greenwood and A. Earnshaw: Chemistry of the elements.

**Biophysics:**
Biophysics laboratory manual.
Department of Biophysics and Cell Biology, 2001.
M. Shinitzky: Biomembranes. Physical aspects.
Edited by János Szöllösi: 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.
R. Chang: Physical chemistry with applications
to biological systems.
P. W. Atkins, J. de Paula: Elements of Physical Chemistry.

**Organic Chemistry Theory I.:**
E. L. Eliel, S. H. Wilen: Stereochemistry of organic compounds.
J.A. Miller, E.F. Neuzil: Modern Experimental Organic Chemistry.

**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.:**
Practical Courses in Genetics.
University Medical School of Debrecen, 2002.
Tom Strachan, Andrew P. Read: Human Molecular Genetics.

**Hungarian Language 1/2.:**

**Pharmaceutical Anatomy:**
T. W. Sadler: Langman's Medical Embriology.
Sobotta: Atlas of Human Anatomy I.-II.
L.P. Gartner: Concise Histology.

**2nd year**

**Organic Chemistry Theory II.:**
E. L. Eliel, S. H. Wilen: Stereochemistry of organic compounds.
synthesis.
J.A. Miller, E.F. Neuzil: Modern Experimental Organic Chemistry.

**Quantitative Analytical Chemistry Theory I.**
Harris, D. C.: Quantitative Chemical Analysis.

**Human Physiology I.:**

**Pharmaceutical Biochemistry I.:**

**Physical Chemistry II.:**
Katalin Ósz, Attila Bényei: Physical Chemistry Laboratory Measurements (for students of Pharmacy, Chemistry and Chemical Engineering).
Egyetemi Kiadó, 2011.
Peter Atkins and Julio de Paula: Elements of Physical Chemistry.
Dr. Katalin Ósz, Dr. Attila Bényei: Physical Chemistry (practice information).
URL: http://fizkem.unideb.hu/physchem.html

**Colloid and Surface Chemistry Theory:**
Pashley, RM, Karaman, ME: Applied and Surface Chemistry.
Barnes, GT, Gentle, IR: Interfacial science.
Cosgrowe T.: Colloid Science.

**Human Physiology II.:**
Physiology Practice. A Laboratory Guide.
Physiology Practice. Exercise Book.

**Pharmaceutical Biochemistry II.:**
Thomas M. Devlin: Textbook of Biochemistry with Clinical Correlations.

**Pharmaceutical Technology Theory I.:**
M.E. Aulton: Pharmaceutics: The science of dosage form design.
2002.
European Pharmacopoiea.
Pharmacopoea Hungarica Editio VIII..
Formulae Normales.

**Pharmaceutical Technology Practice I. (Prescription Writing I.):**
Miklós Vecsényi Ph.D., D.Pharm, Ildikó Bácskay Ph.D., D.Pharm: „Practicals in
Pharmaceutical Technology - Prescription Pharmacy”.

Pharmacognosy Theory I.:

Pharmacognosy Practice I.:

Latin Medical Terminology:

Modern biophysical methods in biology and medicine:

3rd year
Pharmaceutical Technology Theory II.:

Clinical Biochemistry I.:


Pharmacognosy Theory II.:

Pharmacognosy Practice II.:

Pharmaceutical Chemistry Theory I.:

Medical Hungarian I.:
Krasznai, Mónika: Bevezetés a gyógyszerész szaknyelvbe. 2010.

Pharmaceutical Neurobiology:
Moore K.L., Dalley, A.F., Agur, A. M. R.:
Clinically Oriented Anatomy.

Sobotta: Atlas of Human Anatomy I.-II.,

T. W. Sadler: Langman's Medical Embriology.

A. Fonyó: Principles of Medical Physiology.


A. Fonyó: Principles of Medical Physiology.


János Kappelmayer and László Muszbek: Practicals in laboratory medicine.


Immunology:
Abbas, A. K., Lichtman, A. H., Pillai, S.: Basic Immunology.
Gogolák P., Koncz G.: Short textbook of Basic Immunology.

Medical Hungarian II.:
Krasznai, Mónika: Bevezetés a gyógyszerész szaknyelvbe.
2010.

Functional Anatomy of the Visual System:
Eric R. Kandel, MD (winner of the Nobel Prize in 2000); James H. Schwartz, MD, PhD; Thomas M. Jessell, PhD; Steven A. Siegelbaum, PhD; and A. J. Hudspeth, PhD: Principles of Neural Science.
Gordon M. Shepherd: The Synaptic Organization of the Brain.

Selected Problems of the Neural Control: Modelling of Single Neurons and Neural Networks:
Christof Koch and Idan Segev: Methods in Neuronal Modeling, From Synapses to Networks.

Latin Medical Terminology:
Répás László, 2012.
Pharmaceutical Technology Theory IV.:  
M.E. Aulton: Pharmaceutics: The science of dosage form design.  
2002.

Pharmacology Theory I.:  
Laurence L. Brunton (editor): Goodman & Gilman's The pharmacological Basis of Therapeutics.  
Árpád Tósaki Ph.D., D.Sc., D.Pharm: Pharmacology and therapy.  
URL: http://gyogyszertankonyv.med.unideb.hu/files/Pharmacology_and_therapy.pdf

Medical Microbiology I.:  
Levinson, W.: Review of Medical Microbiology and Immunology.  
Lajos Gergely: Diagnostic Medical Microbiology, Laboratory Exercises.  
1989.  

Pharmaceutical and Bioanalytical Chemistry I.:  
Kellner, Robert A.: Analytical Chemistry.  
Pataki L.: Basic analytical chemistry.  
Akadémiai Kiadó, 1980.  
István Bak M.Sc., Ph.D.: Modern analytical techniques in the pharmaceutical- and bioanalysis.  
URL: http://gyogyszertankonyv.med.unideb.hu/files/analytical_techniques.pdf

Hungarian Language Elective - Medical I.:  
Marthy Annamária, Végh Ágnes: Egészségére!  
Magyar orvosi szaknyelv.  

Pharmacology Practice I.:  
Laurence L. Brunton (editor): Goodman & Gilman's The pharmacological Basis of Therapeutics.  
Árpád Tósaki Ph.D., D.Sc., D.Pharm: Pharmacology and therapy.  
URL: http://gyogyszertankonyv.med.unideb.hu/files/Pharmacology_and_therapy.pdf

Preventive Medicine and Public Health:  

Pharmacology Theory II.:  
Laurence L. Brunton (editor): Goodman & Gilman's The pharmacological Basis of Therapeutics.  
Árpád Tósaki Ph.D., D.Sc., D.Pharm: Pharmacology and therapy.  
URL: http://gyogyszertankonyv.med.unideb.hu/files/Pharmacology_and_therapy.pdf

Medical Microbiology II.:  
Levinson, W.: Review of Medical Microbiology and Immunology.  
Lajos Gergely: Diagnostic Medical Microbiology, Laboratory Exercises.  
1989.  

Bioethics:


István Bak M.Sc., Ph.D.: Modern analytical techniques in the pharmaceutical- and bioanalysis. URL: http://gyogyszertankonyv.med.unideb.hu/files/analytical_techniques.pdf


Dr. Attila Bényei: Polymorphism of pharmaceuticals.
URL: http://fizkem.unideb.hu/physchem.html

5th year
Quality Control:

Pharmaceutical Psychology:
Segerstrale, U., Peter Molnár: Non-verbal communication: where nature meets culture.
Lawrence Erlbaum Associate, Mahwah, New Jersey, 1997.

Biopharmacy:
Leon, Shargel; Andrew, Yu: Applied Biopharmaceutics & Pharmacokinetics.
Gabor Halmos, Pharm.D., Ph.D. Professor and Chair Department of Biopharmacy: Selected chapters of Biopharmacy.

URL: http://gyogyszertankonyv.med.unideb.hu/files/BIPHARMACY.pdf

Hungarian Language Elective - Medical I.:
Marthy Annamária, Végh Ágnes: Egészségére! Magyar orvosi szaknyelv.
Semmelweis Egyetem Egészségtudományi Kar, 2012.

Radiopharmacy Theory:
Univ. notebook, 1997.

Radiopharmacy Practice:
Univ. notebook, 1997.

Hungarian Language Elective - Medical II.:
Marthy Annamária, Végh Ágnes: Egészségére! Magyar orvosi szaknyelv.
Semmelweis Egyetem Egészségtudományi Kar, 2012.