BULLETIN

UNIVERSITY OF DEBRECEN

ACADEMIC YEAR of 2014/2015

FACULTY OF PHARMACY

Coordinating Center for International Education

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CHAPTER 1
INTRODUCTION

MISSION STATEMENT OF THE UNIVERSITY OF DEBRECEN

The aim of the Medical School 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 of the Medical School of the University of Debrecen 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 Center are determined to preserve this achievement. Special attention is given to facilitate and support the close co-operation of researchers representing basic science and clinical research, and/or interdisciplinary studies.

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

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

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

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

HIGHER EDUCATION IN DEBRECEN

A Brief History

1235: First reference to the town of Debrecen in ancient charters.
1538: Establishment of the “College of Reformed Church” in Debrecen.
1567: Higher education begins in the College.
1693: Declaration of Debrecen as a “free royal town”.
1849: Debrecen serves as the capital of Hungary for 4 months.
1912: Establishment of the State University of Debrecen comprising the Faculties of Arts, Law, Medicine and

Theology.
1918: Inauguration of the Main Building of the Medical Faculty by King Charles IV of Hungary.
1921: The Medical Faculty becomes operational.
1932: Completion of buildings of the campus.
1944: Although during the Second World War, Debrecen became the capital of Hungary again (for 100 days), the University itself is abandoned for a while.
1949: The only year when the University has five faculties.
1950: The Faculty of Law idles; the Faculty of Science is established.
1951: The University is split up into three independent organizations: Academy of Theology, Medical School, Lajos Kossuth University of Arts and Sciences.
1991: The "Debrecen Universitas Association" is established.
1998: The "Federation of Debrecen Universities" is founded.
2000. The federation is transformed into the unified "University of Debrecen" with all the relevant faculties and with some 20,000 students.

Debrecen is the traditional economic and cultural center of Eastern Hungary. In the 16th century Debrecen became the center of the Reformed Church in Hungary and later it was referred to as the "Calvinist Rome". The 17th century was regarded as the golden age of the city because Debrecen became the mediator between the three parts of Hungary: the part under Turkish occupation, the Kingdom of Hungary and the Principality of Transylvania. For short periods of time, Debrecen served twice as the capital of Hungary. Nowadays, with its population of approximately a quarter of a million, it is the second largest city in Hungary.

Debrecen is a unique city: although it has no mountains and rivers, its natural environment is rather interesting. One of the main attractions and places of natural uniqueness in Hungary is Hortobágy National Park, known as "puszta" ("plain"), which begins just in the outskirts of Debrecen. This is the authentic Hungarian Plain without any notable elevations, with unique flora and fauna, natural phenomena (e.g. the Fata Morgana), and ancient animal husbandry traditions. The region is unmatched in Europe, no matter whether one considers its natural endowments or its historic and ethnographic traditions. A very lovely part of Debrecen is the "Nagyerdő" ("The Great Forest"), which is a popular holiday resort. Besides a number of cultural and tourist establishments, luxurious thermal baths and spas, Nagyerdő accommodates the University campus too.

The history of higher education in Debrecen goes back to the 16th century when the College of the Reformed Church was established. The University Medical School of Debrecen has its roots in this spiritual heritage. It was in the year of the millennium of the establishment of Hungary (1896) when the foundation of the present University was decided. The University of Debrecen was established in 1912, initially having four faculties (Faculties of Arts, Law, Medicine and Theology). The University was officially inaugurated by King Charles IV of Hungary on October 23rd, 1918.

The educational activity at the University started in 1924, although the construction of the whole University was completed only in 1932. In 1951 the Faculty of Medicine became a self-contained, independent Medical University for training medical doctors.

The special training of dentists began in 1976. As a further development the University Medical School established the Health College of Nyíregyháza in 1991. In 1993, as part of a nationwide program, the University was given the rights to issue scientific qualifications and new Ph.D. programs were also launched. Several new programs (e.g. the training of molecular biologists, pharmacists, general practitioners) were commenced in the '90s. The Faculty of Public Health was established in 1999, while the Faculty of Dentistry was founded in the academic year 2000/2001.

The architectural and instrumental developments of the University Medical School of Debrecen (UMSD) were completed in several stages. In the '70s, the Theoretical Building and the new building of Dentistry were completed. The second phase of development was the establishment of the new Dialysis Center and the Cardiac Surgery Unit in the early '90s. The next stage was the construction of the 3rd Department of Medicine and various radiological units (PET, linear accelerator, etc.) in the second half of the decade. The Life Science Building and a new library (with lecture halls, reading rooms and 200 computer terminals freely available for the students) were completed in 2006. At present, the Debrecen Building of the Health College is being planned.

The Medical School of the University of Debrecen 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 lead by more than 100 accredited, highly qualified coordinators and tutors.

Medical Activity at the University of Debrecen

The Medical School of the University of Debrecen 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 serving 62,000 inpatients and 670,000 outpatients every year. The Medical School of the University of Debrecen 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 (including an adult hemodialysis center, open-heart surgery facilities, kidney transplantation unit, etc.).

The Kenézy Gyula County Infirmary (with some 1,400 beds) is strongly affiliated with the Medical School of the University of Debrecen and plays an important role in teaching the practical aspects of medicine. The Department of Obstetrics and Gynecology of the Medical School of the University of Debrecen has been an official reference center of the World Health Organization (WHO) for several years. There are also close contacts between the University and other health care institutions, mainly (but not exclusively) in its closer region. The Medical School of the University of Debrecen has a Teaching Hospital Network consisting of 10 hospitals in nearby counties.

It is also of importance that the Medical School of 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 Medical School of the University of Debrecen

Scientific research is performed both at the departments for basic sciences and at the laboratories of clinical departments. The faculty members of the Medical School of the University of Debrecen publish about 600 scientific papers every year in international scientific journals. According to the scientometric data, the Medical School of the University of Debrecen 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).

New Facilities at the University of Debrecen

The development of the Medical School of the University of Debrecen has been accelerated in recent years, with the following important results:

-New units have been developed to increase the quality of the medical care (Center for Nephrology, a newly constructed building serving the Cardiology and Heart Surgery Departments, a Kidney Transplantation Unit, a new building for the 3rd Department of Medicine).

-Up to date medical imaging equipments (including X-ray, MRI and PET) are now available for research and diagnostic purposes.

-The internationally acknowledged Gamma Radiosurgery Center of Debrecen allows the application of a unique method for the treatment of neurological deseases - even within one day.

-A Hungarian-Japanese Center for Electron Microscopy has been founded.

-The fiber optic cable computer network of the University is connected to the Internet World Academic Computer System via the metropolitan FDDI network. Students can use up to 30 terminals at the same time in the Education Center, in the Center for Educational Development, and in a number of other departments. There is a continuous development in this area with new Ethernet and ATM networks.

-A new computer center will be established for students, having 40 workstations connected to the Internet in one of the Students' Hostels. The access will be available free of charge for all students of the Medical School of the University of Debrecen .

-A new linear accelerator has been purchased for patients requiring radiology treatment.

-New Life Science Building and Library have been built recently.

-A similar project, aimed at the construction of a new building for the Health College Faculty in Debrecen, has been initiated.

-A new building belonging to the Faculty of Dentistry has been built.

-In the frame of the “Augusta Program” – that was launched in 2005 – a center has been established dealing with cardiovascular and tumorous diseases. The primary goal of the program is to reduce the mortality of these severe disorders.

-A new PET/CT equipment started to operate in the Medical School of the University of Debrecen in May 2007. This high-tech equipment not only allows easier, earlier, and more precise diagnosis of various tumorous diseases, but it also helps in the early recognition of several neurological and cardiovascular disorders.

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 Institue of Pharmaceutical Sciences (2001) the outstanding cooperation, effort, compromise approach, and continuous support of the management of the former Debrecen University of Medical Sciences and Lajos Kossuth University of Sciences were inevitable. Without these and the active assistance and collaboration of the colleagues and the university's management, the Faculty of Pharmacy could not have been in its current form and developed for the 100th year jubilee anniversary of establishment of the University of Debrecen. The coordination and improvement of the pharmacist-training was further concentrated into the hands of Professor Géza Mezey, the director of the Institute of Pharmaceutical Sciences (2001), until his death (17October, 2001).

The main building of the present Faculty of Pharmacy, where the Center's Pharmacy and the Dean's Office had been placed, was handed over in 2001 and the new building fully satisfies in every way the widespread supply of medicinal products towards the departments of the University of Debrecen and meets the requirements of pharmacist-training according to the standards of the European Union. Without the previous and present management of the University, the devoted help and cooperation of the departments belonging to the Faculty of General Medicine and the former Faculty of Natural Sciences at Lajos Kossuth University of Sciences where the acquisition of the basic subjects of Chemistry and Biology is ensured for the students of Pharmacy, the pharmacist-training would not have become possible at the University of Debrecen. The Hungarian anthem was first played in 2001 as this was the first year when pharmacist degrees were awarded at the ceremonial council meeting of the University of Debrecen. With the support and guidance of the management of that time and of he president of the Medical and Health Science Center, the draft for the accreditation of the Institute of Pharmaceutical Sciences to become a faculty was prepared. In 2003 it was approved by the Hungarian Accreditation Committee and from this year on the Faculty of Pharmacy started to operate as a separate organizational unit at the University of Debrecen, as its eleventh faculty. One of the fundamental prerequisites for the Institute of Pharmaceutical Sciences to become a faculty was to establish at least five independent departments. The University fulfilled this basic requirement by the founding of the Department of Pharmaceutical Technology (1996), Pharmacology (1998), Pharmaceutical Management and Organization (1999), Biopharmacy (2000), Pharmaceutical Chemistry (2001), Clinical Pharmacology (2001), and thus the Department 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
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CHAPTER 7
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CHAPTER 10
UNIVERSITY CALENDAR

UNIVERSITY CALENDAR FOR PHARMACY PROGRAM 2014/2015 ACADEMIC YEAR

CRASH COURSE OF HUNGARIAN LANGUAGE: **August 25 - September 5, 2014**
OPENING CEREMONY:September 7, 2014
PHARMACIST GRADUATION: June, 2015
1st SEMESTER

Year	**Course**	**Examination Period**
Basic Medicine Course	September 8 - December 19, 2014 (15 weeks)	December 22, 2014 - February 6, 2015 (7 weeks)
1st year Pharmacy 2nd year Pharmacy 3rd year Pharmacy 4th year Pharmacy	September 8 - December 19, 2014 (15 weeks)	December 22, 2014 - February 6, 2015 (7 weeks)
5th year Pharmacy	July 21- September 19, 2014 (2 months state exam practice) September 22 - December 19, 2014 (13 weeks)	December 22, 2014 – February 6 2015 (7 weeks)

2nd SEMESTER

Year	**Course**	**Examination Period**
BMC	February 9 - May 22, 2015 (15 weeks)	May 25 - June 19, 2015 (4 weeks)
BMC II	January 12 - June 26, 2015 (24 weeks)	June 29 - July 17, 2015 (3 weeks)
1st year Pharmacy 2nd year Pharmacy 3rd year Pharmacy 4th year Pharmacy	February 9 – May 22, 2015 (15 weeks)	May 25 – July 10, 2015 (7 weeks)
5th year Pharmacy	February 2 –May 29, 2015 (4 months state exam practice)	5th year: May 25 - July 17, 2015 (8 weeks)

SUMMER PRACTICE

YEAR	DATE IN 2015
2nd year Pharmacy practice	July 13 - August 7, 2015 or August 10 - September 4, 2015 (4 weeks)
3rd year Pharmacy practice	July 13 - August 7, 2015 or August 10 - September 4, 2015 (4 weeks)

DEADLINE OF ENROLLING FOR THE SUMMER PRACTICE IS **APRIL 17, 2015**

CHAPTER 11
ACADEMIC PROGRAM FOR THE BASIC MEDICINE COURSE

ACADEMIC PROGRAM FOR THE BASIC MEDICINE COURSE

Basic Medicine Course (BMC, Pharmacy)
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 are strictly forbidden. Electronic devices (cell phones, tablets, 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 Education Office.

One might have a maximum of four seminar absences. Students missing 5-7 seminars 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 8 or more seminars are dismissed from the class.

The knowledge of the 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 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 above 60%, AND
- (s)he successfully completed all the SCTs at least with 40% score, AND
- (s)he has a maximum of 4 absences.

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 above 60%, or
- the average of the ESE score taken 3 times plus the scores of the 3 best SCTs in the 2nd semester with the bonus points is at least 60% , AND
- (s)he has a maximum of 4 absences.

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

The average of the ESE score and the best 3 2nd semester SCTs **OR** the average of the best 6 SCTs	Bonus points (%)
51	1
52	2
53	3
54	4
55	5
56	6
57	7
58	8
59	9

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

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

Absence for any reason counts as 0%.

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

Subject: **INTRODUCTION TO BIOLOGY I.**
Year, Semester: Basic Medicine Course, 1st semester
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 (1st SCT)

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 (2nd SCT)

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 its role in heredity 1.
DNA and its role in heredity 2.
DNA and its 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 (3rd SCT)

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

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

15th week:
Lecture: Fungi: recyclers, pathogens, parasites 1.
Fungi: recyclers, pathogens, parasites 2
Differential gene expression in development 1.
Differential gene expression in development 2.
Self Control Test (4th SCT)

Academic advisor: Dr. András Penyige; Department of Human Genetics

Subject: **INTRODUCTION TO BIOLOGY II.**
Year, Semester: Basic Medicine Course, 2nd semester
Number of teaching hours:
Lecture: **45**
Seminar: **60**

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 SCT)

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

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

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

8th week:
Lecture: Salt and Water Balance and Nitrogen Excretion 1.
Salt and Water Balance and Nitrogen Excretion 2.
Self Control Test (6th SCT)

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

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

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

12th week:
Lecture: Neurons and Nervous system 5.
Effectors: making Animals move 1.
Self Control Test (7th SCT)

13th week:
Lecture: Effectors: making Animals move 2.
Effectors: making Animals move 3.
Animal reproduction and Animal Development 1.

14th week:
Lecture: Animal reproduction and Animal Development 2.
Animal reproduction and Animal Development 3.
The human Reproduction System and Sexual Behavior.

15th week:
Lecture: Sensory systems 1.
Sensory systems 2.
Self Control Test (8th SCT)

Academic advisor: Dr. Norbert Szentandrássy, Department of Physiology
Recommended book: Sadava, Hills, Heller, Berenbaum: Life (10th edition)

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

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

2nd week:
Lecture: 3-4. Coordinate systems, graphing, solving equations. Functions, calculator usage

3rd week:
Lecture: 5-6. Motion in one dimension, displacement, velocity, acceleration, motion diagrams. Freely falling objects.
Self Control Test (1st SCT)

4th week:
Lecture: 7-8. Vectors and their properties. Components of vectors. Displacement, velocity and acceleration in two dimensions. Motion in two dimensions. Relative velocity.

5th week:
Lecture: 9-10. The laws of motion. Newton's First, Second and Third Law. Applications of Newton's Laws. Forces of friction.

6th week:
Lecture: 11-12. Energy. Work. Kinetic energy and the work-energy theorem. Gravitational potential energy. Spring potential energy. System and energy conservation. Power. Work done by varying forces.

7th week:
Lecture: 13-14. Momentum and impulse. Conservation of momentum. Collisions. Elastic and inelastic collisions.Angular speed and angular acceleration.
Self Control Test (2nd SCT)

8th week:
Lecture: 15-16. Rotational motion under constant angular acceleration. Centripetal acceleration. Newtonian gravitation. Kepler's laws.Torque and the two conditions for equilibrium. The center of gravity

9th week:
Lecture: 17-18. Rotational kinetic energy. Angular momentum. States of matter. Deformation of solids. The Young's, shear and bulk modulus.

10th week:
Lecture: 19-20. Density and pressure. Variation of pressure with depth. Pressure measurements. Buoyant forces and Archimedes's principle. Fluids in motion. Temperature and the zeroth law of thermodynamics. Thermometers and temperature scales. Thermal expansion of solids and fluids. Macroscopic description of an ideal gas. The kinetic theory of gases.

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

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

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

14th week:
Lecture: 27-28. Sound. Energy and intensity of sound waves. Shock waves, standing waves. Doppler effect. The ear and the principles of hearing.
Self Control Test (4th SCT)

15th week:
Lecture: 29-30. Interactive seminar and preparation for ESE.

The content of each Self Control Test is indicative and subject to change with prior notice.

Academic Advisor: Dr. Zoltán Varga, Department of Biophysics and Cell Biology
Recommended book: Serway, Vuille: College Physics (9th edition)

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

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

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

3rd week:
Lecture: 5-6. Electric current. Current and voltage measurements in circuits. Resistance and Ohm's law. Resistivity, temperature variation of resistance. Semiconductors and superconductors. Electrical activity of the heart. Defibrillators.
Self Control Test (5th SCT)

4th week:
Lecture: 7-8. Direct current circuits. Resistors in parallel and series. Kirchhoff's rules and complex DC circuits. RC circuits. Conduction of electrical signals by neurons.

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

6th week:
Lecture: 11-12. Induced emf and magnetic flux. Faraday's law of induction. Motional emf. Lenz's law. Generators. Self-inductance RL circuits.

7th week:
Lecture: 13-14. Alternating current. Resistors, capacitors and inductors in AC circuits. The transformer. Properties of electromagnetic waves. The spectrum of electromagnetic waves.
Self Control Test (6th SCT)

8th week:
Lecture: 15-16. The nature of light. Reflection, refraction and dispersion. Prisms. The rainbow. Huygen's principle. Total internal reflection and its medical applications.

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

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

11th week:
Lecture: 21-22. Quantum physics. Blackbody radiation. Photoelectric effect. Particle theory of light. The production and attenuation of X-ray. Characteristic X-ray.
Self Control Test (7th SCT)

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

13th week:
Lecture: 25-26. Some properties of the nuclei. Binding energy. Radioactivity, the decay processes. Medical application

of radioactivity. Nuclear reactions. Nuclear fission and fusion. Positron and other antiparticles. Mesons and quarks.
Self Control Test (8th SCT)

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

15th week:
Lecture: Final exam.

Academic Advisor: 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 semester
Number of teaching hours:
Lecture: **60**
Seminar: **30**

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

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

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

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

5th week:
Lecture: Chemical bonds: metallic, ionic and covalent bonds. Electron-dot structures for molecular compounds and polyatomic ions.
Self Control Test (1st SCT)

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

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

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

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

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

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

12th week:
Lecture: Chemical reactions in perspective. Oxidation and reduction. Oxidation state. The activity series of the elements.
Self Control Test (3rd SCT)

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

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

15th week:
Lecture: Self Control Test (4th SCT). Summary and discussion.

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

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

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

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

4th week:
Lecture: Covalent bonding in organic compounds. Alkanes.
Self Control Test (5th SCT)

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

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

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

8th week:
Lecture: Self Control Test (6th SCT). Ethers and organic sulfur compounds.

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

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

11th week:
Lecture: Carboxylic acids. Saturated monocarboxylic acids. Unsaturated carboxylic acids. Dicarboxylic acids. Properties of carboxylic acids. Reactions of carboxylic acids.
Self Control Test (7th SCT)

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

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

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

15th week:
Lecture: Summary and discussion.
Self Control Test (8th SCT)

Academic advisor: Dr. Ilona Farkas, 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 2nd
Number of teaching hours:
Practical: **36**

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

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

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

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

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

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

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

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

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

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

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

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

CHAPTER 12
ACADEMIC PROGRAM FOR THE INTENSIVE BASIC MEDICINE COURSE

ACADEMIC PROGRAM FOR THE INTENSIVE BASIC MEDICINE COURSE

Intensive Basic Medicine Course (Intensive BMC, Pharmacy)
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 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 are strictly forbidden. Electronic devices (cell phones, tablets, 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 Education Office.
One might have a maximum of seven seminar absences. Students missing 8-9 seminars cannot be exempted from the Final Examination (FE), regardless of their score reached on the Self Control Tests. Students missing 10 or more seminars are dismissed from the class.
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 above 60%, AND
- (s)he has a maximum of 7 absences.

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

The average of the best 5 SCTs	Bonus points (%)
51	1
52	2
53	3
54	4
55	5
56	6
57	7
58	8
59	9

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

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

Absence for any reason counts as 0%.

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

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

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

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

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

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

5th week:
Lecture: Cell membranes 3.
Cell membranes 4.
Energy, enzymes and metabolism 1.
Energy, enzymes and metabolism 2.
Self Control Test (1st SCT)

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 (2nd SCT)

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 (3rd SCT)

14th week:
Lecture: Tissues, organs, organ systems 1-4.

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 (4th SCT)

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 and Nitrogen Excretion. Hormones 1.
Self Control Test (5th SCT)

21st week:
Lecture: Hormones 2.
Neurons and Nervous system.

22nd week:
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 (6th SCT)

Academic advisors: Dr. András Penyige, Department of Human Genetics
Dr. Norbert Szentandrássy, Department of Physiology
Recommended book: Sadava, Hills, Heller, Berenbaum: Life (10th edition)

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

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

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

3rd week:
Lecture: 5-6. The laws of motion. Newton's First, Second and Third Law. Application of Newton's Laws. Forces of friction.
Self Control Test (1st SCT)

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

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

6th week:
Lecture: 11-12. Angular speed and angular acceleration. Rotational motion under constant angular acceleration.

Centripetal acceleration. Newtonian gravitation. Kepler's laws.

7th week:
Lecture: 13-14. Torque and the two conditions for equilibrium. The center of gravity.
Rotational kinetic energy. Angular momentum.
Self Control Test (2nd SCT)

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

9th week:
Lecture: 17-18. Temperature and the zeroth law of thermodynamics. Thermometers and temperature scales. Thermal expansion of solids and fluids.
Macroscopic description of an ideal gas. The kinetic theory of gases.

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

11th week:
Lecture: 21-22. The second law of thermodynamics. Entropy. Refrigerators and heat pumps.. Elastic potential energy. Hook's law. Simple harmonic motion. Motion of a pendulum.
Self Control Test (3rd SCT)

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

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

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

15th week:
Lecture: 28-29. Electrical energy and capacitance.
The parallel plate capacitor. Combinations of capacitors. Energy stored in capacitors. Capacitors with dielectric.
Self Control Test (4th SCT)

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

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

18th week:
Lecture: 34-35. Magnetism. Magnetic field. Earth's magnetic field. Magnetic force on current carrying conductors. Torque on a current loop and electric motors.
Magnetic field of a long straight wire and Ampere's law. Magnetic field between two parallel conductors. Magnetic field of loops and solenoids.
Self Control Test (5th SCT)

19th week:
Lecture: 36-37. Induced emf and magnetic flux. Faraday's law of induction. Motional emf. Lenz's law.

Generators. Self-inductance RL circuits.

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

21st week:
Lecture: 40.The nature of light. Reflection, refraction and dispersion.
Prisms. The rainbow. Huygen's principle. Total internal reflection and its medical applications.
Self Control Test (6th SCT)

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

23rd week:
Lecture: 44-45. Wave optics. Conditions for interference, polarization of light. Diffraction.
The camera, the simple magnifier, the compound microscope, the telescope and the eye.

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

Academic advisor: Dr. Attila Jenei, Department of Biophysics and Cell Biology
Recommended book: Serway, Vuille: College Physics (9th edition)

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

1st week:
Lecture: L1. Introduction to general chemistry. Elements. Symbols for the elements. The SI system of measurement.
L2. Atoms. The structure of atoms. Nuclear arithmetic. Molecules and ions, compounds and mixtures.

2nd week:
Lecture: 1-2. Chemical formulas. Naming chemical compounds. Chemical equations. Avogadro's number and the mole. Atomic, molecular and molar mass relationships. Stoichiometry: chemical arithmetic. Yields of chemical reactions. Empirical and molecular formulas.

3rd week:
Lecture: 3-4. Light and the electromagnetic spectrum. Atomic spectra. The Bohr model of the hydrogen atom. The quantum mechanical model of the atom. Orbitals and quantum numbers. L2 Electron configurations and the periodic table. Classification of the elements. Representative and transition elements.

4th week:
Lecture: 5-6. The sizes of atoms and ions. Ionization energy, electron affinity.
Self Control Test (1st SCT)

5th week:
Lecture: 7-8. Chemical bonds: metallic, ionic and covalent bonds. Electron-dot structures for molecular compounds and polyatomic ions. Single and multiple covalent bonds. Molecular shapes: the VSEPR model. Valence bond theory. Hybridization.

6th week:
Lecture: 9-10. Intermolecular forces. The gaseous state. Gases and gas pressure. The gas laws. The ideal gas law. Stoichiometric relationships with gases. Kinetic - molecular theory of gases.

7th week:
Lecture: 11-12. Liquid and solid states. Phase changes. Evaporation, vapor pressure, boiling point. Solutions and their properties. Concentration of solutions. Units of concentration: molarity, mass percent, molality. Dilution of solutions. Some factors affecting solubility.

8th week:
Lecture: 13-14. The chemistry of water. Ions in aqueous solution: electrolytes and nonelectrolytes. Reactions in aqueous solution. Discussion of general chemistry 1.

9th week:
Lecture: 15-16. Chemical equilibrium. The equilibrium constant. Factors that alter the composition of an equilibrium mixture. Self Control Test (2nd SCT)

10th week:
Lecture: 17-18. Acids and bases. The pH in solutions of strong acids and strong bases. Equilibria in solutions of weak acids. Equilibria in solutions of weak bases.

11th week:
Lecture: 19-20. Thermochemistry. Energy changes and energy conservation. Internal energy and state functions. Expansion work. Energy and enthalpy. The thermodynamic standard state. Enthalpies of physical and chemical changes. Hess's law. Oxidation and reduction. Oxidation state. The activity series of the elements. Balancing redox reactions. Galvanic cells.

12th week:
Lecture: 21-22. Discussion of general chemistry 2. Self Control Test (3rd SCT)

13th week:
Lecture: 23-24. Introduction to organic chemistry. Saturated hydrocarbons: alkanes.

14th week:
Lecture: 25-26. Cycloalkanes. Unsaturated hydrocarbons: alkenes and alkynes.

15th week:
Lecture: 27-28. Aromatic compounds: the structure and properties of benzene. The reactions of benzene. Heteroaromatic compounds.

16th week:
Lecture: 29-30. Organic halogen compounds. Alcohols and phenols.

17th week:
Lecture: 31-32. Ethers and organic sulfur compounds. Self Control Test (4th SCT)

18th week:
Lecture: 33-34. Aldehydes, ketones and quinones. Nitrogen containing organic compounds: the structure and properties of amines. Basicity and reactions of amines.

19th week:
Lecture: 35-36. Heterocyclic amines. Amines of biological importance. Discussion of Organic chemistry 1.

20th week:
Lecture: 37-38. Carboxylic acids: classification and nomenclature. Self Control Test (5th SCT)

21st week:
Lecture: 39-40. Properties of carboxylic acids. Reactions of carboxylic acids. Dicarboxylic acids. Unsaturated acids. Carboxylic acid derivatives: esters, fats, lactones, amides, lactams, thiol esters anhydrides, acyl chlorides.

22nd week:
Lecture: 41-42. Salts and detergents. Substituted carboxylic acids: halo acids, hydroxy acids, keto acids, amino acids. Stereochemistry. Types of isomerism.

23rd week:
Lecture: 43-44. Optical activity: properties of enantiomers and diastereomers. Discussion of Organic chemistry 2.

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

Academic Advisor: Dr. Éva Bakó, Department of Medical Chemistry
Recommended books: McMurry, Fay: Chemsitry (6th edition)
Erdődi, Csortos: Organic Chemistry for Premedical Students (2010)

CHAPTER 13
ACADEMIC PROGRAM FOR CREDIT SYSTEM

ACADEMIC PROGRAM FOR CREDIT SYSTEM

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

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

The general principles of the credit system are the following:

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

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

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

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

5. Students accumulate the required amount of credits by passing exams on compulsory, required elective and freely chosen subjects. Completion of every single compulsory credit course is one of the essential prerequisites of getting a degree. Courses belonging to the required elective courses are closely related to the basic subjects, but the information provided here is more detailed, and includes material not dealt with in the frame of the compulsory courses. Students do not need to take all required elective courses, but they should select some of them wisely to accumulate the predetermined amount of credits from this pool. Finally, a certain amount of credits should be obtained by selecting from the freely chosen courses, which are usually not related to the basic (and thus mandatory) subjects, but they offer a different type of knowledge.

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

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

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

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

10. There are 12 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.

Compulsory courses												
1. year												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
Biophysics	**GYBIF06P2**						15	13	16	ESE	4	Mathematics, Physics
General Chemistry Practice	**GYAKE04P1**		15	60	AW5	3						None
General Chemistry Theory	**GYAKE03P1**	45			ESE	5						None
Hungarian Crash Course	**AOG261008**			36	AW5	0						None
Hungarian Language I/1.	**GYHUN01P1**			24	AW5	2						Hungarian Crash Course
Hungarian Language I/2.	**GYHUN04P2**								30	AW5	2	Hungarian Language I/1.
Inorganic and Qualitative Analytical Chemistry Practice	**GYSZK04P2**							15	75	AW5	3	General Chemistry Theory, General Chemistry Practice
Inorganic and Qualitative Analytical Chemistry Theory	**GYSZK03P2**						45			ESE	3	General Chemistry Theory, General Chemistry Practice
Latin Language I.	**GYLAT03P1**		30		AW5	1						None
Latin Language II.	**GYLAT04P2**							30		AW5	1	Latin Language I.
Mathematics	**GYMAT03P1**	30		30	ESE	5						None
Organic Chemistry Practice I.	**GYKSZ04P2**							14	42	AW5	3	General Chemistry Theory, General Chemistry Practice
Organic Chemistry Theory I.	**GYKSZ03P2**						60			ESE	3	General Chemistry Theory, General Chemistry Practice
Pharmaceutical Anatomy	**GYANA02P2**						45		30	ESE	3	Pharmaceutical Biology I.
Pharmaceutical Biology I.	**GYBIO03P1**	21		30	ESE	6						None
Pharmaceutical Biology II.	**GYBIO04P2**						35		30	FE	4	Pharmaceutical Biology I.
Pharmacy Propedeutics	**GYPPO02P1**	15			ESE	2						None
Physical Chemistry I.	**GYFKE03P2**						30	15		ESE	4	Mathematics, Physics, General Chemistry Theory and Practice

Compulsory courses												
1. year (continued)												
		1st semester					2nd semester					
Subjects	**Neptun code**	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	**Prerequisites of taking the subject**
Physics	**GYFIZ02P1**	15		30	ESE	5						None

Compulsory courses												
2. year												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
2nd year Summer Practice for Pharmacy Students	**GY_NYGY_2ND YEAR**								120	SIGN	0	has to be completed before the 3rd year
Basic Biochemistry	**GYBKE02P3**	40		5	ESE	4						Biophysics, Organic Chemistry Theory I., Pharmaceutical Biology II.
Botany Practice	**GYGYN04P3**			30	AW5	1						Pharmaceutical Biology I.
Botany Theory	**GYGYN03P3**	30			ESE	2						Pharmaceutical Biology I.
Colloid and Surface Chemistry Practice	**GYKOLL04P3**			28	AW5	1						Physical Chemistry I.
Colloid and Surface Chemistry Theory	**GYKOLL03P3**	28			ESE	2						Physical Chemistry I.
Human Physiology I.	**GYHEL03P3**	30	15		ESE	4						Pharmaceutical Anatomy, Pharmaceutical Biology I.
Human Physiology II.	**GYHEL04P4**						30	10	20	FE	6	Human Physiology I.
Hungarian Language II/1.	**GYHUN02P3**			30	AW5	2						Hungarian Language I./2.
Hungarian Language II/2.	**GYHUN05P4**								30	AW5	2	Hungarian Language II/1.
Organic Chemistry Practice II.	**GYKSZ08P3**			60	AW5	3						Organic Chemistry Theory I., Organic Chemistry Practice I.
Organic Chemistry Theory II.	**GYKSZ07P3**	60			FE	4						Organic Chemistry Theory I., Organic Chemistry Practice I.
Pharmaceutical Biochemistry	**GYBIK02P4**						40		5	FE	6	Basic Biochemistry
Pharmaceutical Technology I. Practice	**GYTEC10P4**								60	AW5	2	Colloid and Surface Chemistry Theory and Practice, Physical Chemistry II.

Compulsory courses												
2. year (continued)												
		1st semester					2nd semester					
Subjects	**Neptun code**	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	**Prerequisites of taking the subject**
Pharmaceutical Technology I. Theory	**GYTEC09P4**						30			ESE	2	Colloid and Surface Chemistry Theory and Practice, Physical Chemistry II.
Pharmacognosy I. Practice	**GYGND06P4**								60	AW5	3	Pharmaceutical Botany Theory, Pharmaceutical Botany Practice, Organic Chemistry Theory II., Organic Chemistry Practice II.
Pharmacognosy I. Theory	**GYGND05P4**						30			ESE	2	Pharmaceutical Botany Theory, Pharmaceutical Botany Practice, Organic Chemistry Theory II., Organic Chemistry Practice II.
Physical Chemistry II.	**GYFKE04P3**			45	AW5	2						Physical Chemistry I.
Quantitative Analytical Chemistry II. Practice	**GYKVA06P4**								75	AW5	3	Quantitative Analytical Chemistry I.
Quantitative Analytical Chemistry II. Theory	**GYKVA05P4**						15			FE	3	Quantitative Analytical Chemistry I.
Quantitative Analytical Chemistry Theory I.	**GYKVA04P3**	45	15		ESE	4						Inorganic and Qualitative Analitical Chemistry Theory, Inorganic and Qualitative Analytical Chemistry Practice

Compulsory courses												
3. year												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
3rd year Summer Practice for Pharmacy Students	**GY_NYGY_3RD YEAR**								120	SIGN	0	has to be completed before the 4th year
Clinical Biochemistry II.	**GYKPA04P6**						60	8	30	FE	8	Clinical Biochemistry I.
Clinical Biochemistry I.	**GYKPA03P5**	30		14	AW5	4						Pharmaceutical Biochemistry, Human Physiology II.
Immunology	**GYIMM06P6**						26	3	8	ESE*	4	Clinical Biochemistry I.
Medical Hungarian I.	**GYHUN03P5**			30	AW5	2						Hungarian Language II/2.
Medical Hungarian II.	**GYHUN06P6**								30	FE	2	Medical Hungarian I.
Pharmaceutical Chemistry I. Practice	**GYGKE06P5**			30	AW5	2						Organic Chemistry Theory II., Organic Chemistry Practice II.
Pharmaceutical Chemistry I. Theory	**GYGKE05P5**	45			ESE	4						Organic Chemistry Theory II., Organic Chemistry Practice II.
Pharmaceutical Chemistry II. Practice	**GYGKE08P6**								30	AW5	2	Pharmaceutical Chemistry I. Theory, Pharmaceutical Chemistry I: Practice
Pharmaceutical Chemistry II. Theory	**GYGKE07P6**						60			FE	6	Pharmaceutical Chemistry I. Theory, Pharmaceutical Chemistry I. Practice
Pharmaceutical Neurobiology	**GYNEU02P5**	39	16	10	ESE*	3						Human Physiology II., Pharmaceutical Biochemistry
Pharmaceutical Technology II. Practice	**GYTEC12P5**			120	AW5	4						Pharmaceutical Technology I. Theory, Pharmaceutical Technology I. Practice

Compulsory courses												
3. year (continued)												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
Pharmaceutical Technology II. Theory	**GYTEC11P5**	30			ESE	3						Pharmaceutical Technology I.Theory, Pharmaceutical Technology I. Practice
Pharmaceutical Technology III. Practice	**GYTEC14P6**								120	AW5	4	Pharmaceutical Technology II. Theory, Pharmaceutical Technology II. Practice
Pharmaceutical Technology III. Theory	**GYTEC13P6**						30			ESE	3	Pharmaceutical Technology II. Theory, Pharmaceutical Technology II. Practice
Pharmacognosy II. Practice	**GYGND08P5**			60	AW5	3						Pharmacognosy I. Theory, Pharmacognosy I. Practice
Pharmacognosy II. Theory	**GYGND07P5**	30			FE	4						Pharmacognosy I. Theory, Pharmacognosy I. Practice

Compulsory courses												
4. year												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
Bioethics	**GYETI06P8**						30			ESE	1	Pharmaceutical Technology Theory IV., Pharmaceutical Technology Practice IV.
Clinical Basics	**GYKLI02P8**						65	30		ESE	5	Preventive Medicine and Public Health
Clinical Pharmacy	**GYKGY02P8**						30	30		ESE*	4	Preventive Medicine and Public Health
Industrial Pharmaceutical Technology	**GYIPGY01P8**						30		15	ESE	2	Pharmaceutical Technology IV. Theory, Practice
Medical Microbiology I.	**GYMIK09P7**	30	10	10	ESE	5						Immunology, Clinical Biochemistry II.
Medical Microbiology II.	**GYMIK09P8**							15	15	FE	5	Medical Microbiology I.
Pharmaceutical and Bioanalytical Chemistry I.	**GYGMB03P7**	30			ESE	4						Quantitative Analytical Chemistry II. Theory, Pharmaceutical Chemistry II. Theory
Pharmaceutical and Bioanalytical Chemistry II.	**GYGMB04P8**						30		90	FE	6	Pharmaceutical and Bioanalytical Chemistry I.
Pharmaceutical Management and Organisation	**GYMAN02P8**						30			ESE	2	Pharmaceutical Technology IV. Theory, Pharmaceutical Technology IV. Practice
Pharmaceutical Technology IV. Practice	**GYTEC16P7**			45	AW5	3						Pharmaceutical Technology III. Theory, Pharmaceutical Technology III. Practice

Compulsory courses												
4. year (continued)												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
Pharmaceutical Technology IV. Theory	**GYTEC15P7**	30			FE	3						Pharmaceutical Technology III. Theory, Pharmaceutical Technology III. Practice
Pharmacology I. Practice	**GYHAT05P7**			60	AW5	3						Pharmaceutical Chemistry II. Theory and Practice, Pharmacognosy II. Theory and Practice, Clinical Biochemistry II.
Pharmacology I. Theory	**GYHAT04P7**	60			ESE	4						Pharmaceutical Chemistry II. Theory and Practice, Pharmacognosy II. Theory and Practice, Clinical Biochemistry II.
Pharmacology II. Practice	**GYHAT08P8**								60	AW5	3	Pharmacology I. Theory and Practice
Pharmacology II. Theory	**GYHAT06P8**						60			FE	3	Pharmacology I. Theory and Practice
Preventive Medicine and Public Health	**GYMEG08P7**	30	22	8	ESE	5						Immunology, Clinical Biochemistry II.

Compulsory courses												
5. year												
Subjects	Neptun code	1st semester					2nd semester					Prerequisites of taking the subject
		L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	
Biopharmacy	**GYBFA02P9**	30		30	ESE*	6						Medical Microbiology II., Pharmacology II. Theory and Practice, Pharmaceutical Technology IV. Theory and Practice
Clinical Pharmacology	**GYKFA02P9**	30			ESE*	3						Pharmacology II. Theory and Practice, Clinical Pharmacy
Drug Interactions Theory	**GYINT02P9**	30			ESE	4						Pharmacology II. Theory and Practice, Medical Microbiology II.
Galenic Preparations	**GYKOU02P9**	30			ESE	3						Pharmaceutical Technology IV. Theory and Practice
Pharmaceutical Care	**GYGYG02P9**	30			ESE	3						Pharmacology II. Theory and Practice, Pharmaceutical Technology IV. Theory
Pharmaceutical Psychology	**GYPSY02P9**	30			ESE	3						Clinical Pharmacy, Clinical Basic, Bioethics
Quality Control	**GYMIN02P9**	30			ESE	3						Pharmaceutical Technology IV. Theory and Practice, Pharmaceutical Management and Organization
Radiopharmacy Theory	**GYRAD03P9**	15			ESE	1						Clinical Pharmacy, Pharmaceutical Technology IV. Theory and Practice
Radiophyarmacy Practice	**GYRAD04P9**			18	AW5	1						Clinical Pharmacy, Pharmaceutical Technology IV. Theory and Practice

Required elective courses												
1. year												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
Computer Science	**AOINF43T1**			30						AW5	3	None
First Aid and Reanimation	**GYELS42P2**						7		8	AW5	1	None
Library System	**GYKON41P1**			10	AW5	1						None

Required elective courses												
2. year												
Subjects	Neptun code	1st semester					2nd semester					Prerequisites of taking the subject
		L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	
Modern biophysical methods in biology and medicine	**AOMOD42T4**						24			AW5	2	Biophysics
Modern Techniques Allowing the Investigation of Physiological Phenomena	**AOKOR42T4**						20			AW5	2	Human Physiology I.
Problem Based Learning in Physiology	**AOPEL42T4**								30	AW5	3	Human Physiology I.
The Regulatory Role of the Cell Membrane in Physiological and Pathological Conditions	**AOSEM42T4**						20			AW5	2	Human Physiology I.

Required elective courses													
3. year													
		1st semester					2nd semester						
Subjects	**Neptun code**	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	**Prerequisites of taking the subject**
Chemical Biology	**GYKEB42P8**						15			ESE	1	Organic Chemistry II. Theory
Molecular Mechanism of Diseases Concerning Great Populations	**AOG167605**	25			AW5	2						Pharmaceutical Biochemistry
Pharmaceutical Excipients	**GYSEA42G6**						15			AW5	1	Pharmaceutical Technology II. Theory, Pharmaceutical Technology II. Practice
Polymorphism of Pharmaceuticals	**GYGPO208**						28			AW5	2	Pharmaceutical Technology II. Theory and Practice

Required elective courses												
4. year												
Subjects	Neptun code	1st semester					2nd semester					Prerequisites of taking the subject
		L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	
Basic Knowledge of Medical Tools and Surgical Biomaterials for Pharmacotherapeutical Surgical Care	**GYSEE02P8**						8	16	8	AW5	3	Pharmaceutical Technology IV. Theory and Practice
Biocosmetics	**GYBKO42P8**						15			ESE	1	Pharmaceutical Technology IV. Theory
Pharmaceutical Computer Administration	**GYADM42G8**						30			AW5	1	Pharmaceutical Technology II. Theory, Pharmaceutical Technology II. Practice
Pharmacovigliance	**GYFAV42P8**						15			ESE	1	Pharmaceutical Chemistry II.

Required elective courses

5. year

Subjects	Neptun code	1st semester					2nd semester					Prerequisites of taking the subject
		L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	
Juristic Knowledge for Pharmacists	**GYJOG42P9**	14			ESE	1						Pharmaceutical Management and Organisation
Operating System of the Pharmaceutical Industry	**GYGMR42P9**	15			ESE	1						Pharmaceutical Technology IV. Theory and Practice
Pharmaceutical Communication Skills	**GYKOM02P9**			15	AW5	2						Pharmacology II., Theory and Practice, Pharmaceutical Technology IV. Theory
Phytopharmacology	**GYFFA42P9**	24			ESE	1						Pharmacology II. Theory and Practice, Pharmacognosy II. Theory and Practice
Special Training Course - Clinical Pharmacology	**GYSZI43P9**	60			AW5	6						Clinical Pharmacy, Pharmacology II. Theory and Practice
Special Training Course - Industrial Pharmaceutical Technology	**GYSZI44P9**	60			AW5	6						Clinical Pharmacy, Pharmacology II. Theory and Practice
Special Training Course - Synthetic Chemical	**GYSZI45P9**	60			AW5	6						Clinical Pharmacy, Pharmacology II. Theory and Practice
Special Training Course - Toxicology	**GYSZT42P9**	60			AW5	6						Clinical Pharmacy, Pharmacology II. Theory and Practice
State Exam Practice I. Pharmacy dispensing	**GYZVG42P9**			120	AW3	3						Succesful completion of all compulsory subjects (I-IV.)
State exam practice I. Prescription Pharmacy	**GYZVG43P9**			120	AW3	3						Succesful completion of all compulsory subjects (I-IV.)
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

Required elective courses												
5. year (continued)												
		1st semester					2nd semester					
Subjects	Neptun code	L	S	P	Exam	Crd.	L	S	P	Exam	Crd.	Prerequisites of taking the subject
State Exam Practice II. Management	**GYZVG46P10**								120	AW3	3	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
State Exam Practice II. Pharmacy Dispensing	**GYZVG45P10**								120	AW3	3	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
State Exam Practice II. Prescription Pharmacy	**GYZVG44P10**								120	AW3	3	State Exam Practice I. Pharmacy Dispensing, State Exam Practice I. Prescription Pharmacy
Thesis	**GYDIP44P10**									AW5	8	Thesis Consultation
Thesis Consultation	**GYDIP43P9**				AW5	2						None
Veterinary Hygiene	**GYAEU42P9**	30			ESE	2						Pharmacology II. Theory and Practice, Medical Microbiology II.
Operating System of the Pharamaceutical Industry	**GYGMR42P9**	15			ESE	1						

Freely Chosen Courses								
Department	**Subject**	**Neptun code**	**Crd. point**	**Semester**	**Nr. of hours**	**Exam**	**Prerequisites of taking the subject**	**Coordinator**
Department of Anatomy, Histology and Embryology	**Functional Anatomy of Brainstem**	**AOG107704-K1**	1	2	16	AW5	Pharmaceutical Anatomy	Klára Matesz M.D.,Ph.D.,D.Sc.
Department of Anatomy, Histology and Embryology	**Selected Problems of the Neural Control: Modelling of Single Neurons and Neural Networks**	**AOG108504-K1**	1	2	12	AW5	Pharmaceutical Anatomy	Ervin Wolf M.Sc., Ph.D.
Department of Anatomy, Histology and Embryology	**Nociceptive Sensory Information Processing at the Level of the Spinal Cord in Health and Disease**	**AOG1091A4**	1	2	18	AW5	Pharmaceutical Anatomy	Miklós Antal M.D., Ph.D., D.Sc.
Department of Anatomy, Histology and Embryology	**Functional Anatomy of the Visual System**	**AOG108204-K1**	1	2	16	AW5	Pharmaceutical Anatomy	Zoltán Kisvárday M.Sc., Ph.D., D.Sc.
Department of Anatomy, Histology and Embryology	**Advanced Histology**	**AOG107803-K8**	1	1	16	AW5	Pharmaceutical Anatomy	Szabolcs Felszeghy Ph.D., D.D.S.
Department of Behavioural Sciences, Faculty of Public Health	**Inborn Sociality - Socialized Individuality: A New Concept**	**AOG358902-K8**	2	-	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Becoming a Doctor: Thematic Self-Awarness Group**	**AOG359005-K10**	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Evolution and Medicine**	**AOG359101-K8**	1	1	26	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Human Ethology**	**AOG359201**	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**The Basic Problems of Medicine**	**AOG358601**	1	1	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.

Freely Chosen Courses								
Department	**Subject**	**Neptun code**	**Crd. point**	**Semester**	**Nr. of hours**	**Exam**	**Prerequisites of taking the subject**	**Coordinator**
Department of Behavioural Sciences, Faculty of Public Health	**Madness and Psychiatry (Philosophical Approach)**	**AOG359602**	1	2	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Theory of Psychoanalysis and Its Influence on the Concept of Human Being in Medicine**	**AOG359501-K8**	1	1	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Psychic Trauma**	**AOG3511102-K1**	1	2	20	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Theoretical and Methodological Questions of Patient Satisfaction Studies**	**AOG359308**	1	2	15	AW5	None	Csilla Kemény M.A., Ph.D.
Department of Behavioural Sciences, Faculty of Public Health	**Yoga and Meditation I.**	**AOG3512001-K1**	1	1	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Bioethical Cases**	**AOG358706**	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Intercultural Health Care**	**AOG3511605-K1**	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Jewish Medical Ethics I.**	**AOG3514406**	2	1	15	AW5	None	Attila Bánfalvi M.A., Ph.D., C.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Jewish Medical Ethics II.**	**AOG3514407**	2	2	15	AW5	None	

Freely Chosen Courses								
Department	**Subject**	**Neptun code**	**Crd. point**	**Semester**	**Nr. of hours**	**Exam**	**Prerequisites of taking the subject**	**Coordinator**
Department of Behavioural Sciences, Faculty of Public Health	**Bioethics on Films**	**AOG3514405**	1	1	26	AW5	None	Péter Kakuk M.A., Ph.D.
Department of Behavioural Sciences, Faculty of Public Health	**Attachment and Couple Relationships**	**AOG35100001**	2	1	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Yoga and Meditation II.**	**AOG3510401-K1**	2	2	30	AW5	None	Péter Molnár M.D., D.Sc.
Department of Behavioural Sciences, Faculty of Public Health	**Medicine in Art**	**AOG3515003**	0	1-2	20	AW5	None	Sándor Kőmüves M.A., Ph.D.
Department of Behavioural Sciences, Faculty of Public Health	**Issues about the Start and End of Life**	**AOG3515103**	1	1-2	22	AW5	None	Sándor Kőmüves M.A., Ph.D.
Department of Biochemistry and Molecular Biology	**Biochemistry of Apoptosis**	**AOG167406**	1	-	20	AW5	Pharmaceutical Biochemistry	Zsuzsa Szondy M.D., Ph.D., D.Sc.
Department of Biophysics and Cell Biology	**Selected Topics in Cell Biology**	**AOG157403-K1**	1	-	16	AW5	Cell Biology	György Vereb M.D., Ph.D., D.Sc.
Department of Foreign Languages	**Hungarian Language Elective General II.**	**AOG269102**	2	2	30	AW5	Hungarian Crash Course	László Répás M.A.
Department of Foreign Languages	**Hungarian Language Elective General I.**	**AOG268901**	2	1	30	AW5	Hungarian Crash Course	László Répás M.A.
Department of Foreign Languages	**Hungarian Language Elective - Medical I.**	**AOG26108A1-K1**	2	1	30	AW5	None	László Répás M.A.
Department of Foreign Languages	**Hungarian Language Elective - Medical II.**	**AOG26108A2-K1**	2	2	30	AW5	Completion of Hungarian Language Elective Medical I.	László Répás M.A.

Freely Chosen Courses								
Department	**Subject**	**Neptun code**	**Crd. point**	**Semester**	**Nr. of hours**	**Exam**	**Prerequisites of taking the subject**	**Coordinator**
Department of Foreign Languages	**Latin Medical Terminology**	**AOG2611002**	2	2	30	AW5	Latin Language	László Répás M.A.
Department of Medical Microbiology	**Interpretive Clinical Bacteriology and Virology**	**AOG428108**	1	2	14	AW5	Medical Microbiology II.	József Kónya M.D., Ph.D.
Department of Medical Microbiology	**Interesting Issues of Medical Parasitology**	**AOG429907**	1	1	12	AW5	Medical Microbiology I.	Judit Szabó M.D., Ph.D.
Department of Medical Microbiology	**Introduction to Medical Mycology**	**AOG4210207**	1	1-2	14	AW5	Medical Microbiology II.	László Majoros M.D., Ph.D.
Department of Medical Microbiology	**Clinical Mycology**	**AOG4210107**	1	1-2	12	AW5	Medical Microbiology II.	László Majoros M.D., Ph.D.
Division of Clinical Laboratory Science	**Platelet Function and Platelet Function Disorders**	**AOG632006**	1	2	12	AW5	Clinical Biochemistry	

CHAPTER 14
SUMMER PRACTICE FOR PHARMACY STUDENTS

Summer practice for pharmacy students

Proposal for the thematic of 2nd year pharmacy students during summer practice
one month, weekly working time 35 hours, /5 days per week, daily 7 hours set

To become acquanted with the pharmacy. Work and fire safety.
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 Prescriptions, pharmaceutical Latin.
4. Instruments used in Pharmacy, pharmacy balances, small equipments etc. description, cleaning, maintenance.
5. Requirements for packaging of pharmaceutical preparations. Choosing the suitable containers. Packaging materials. Glass, plastic containers, closures. Signatures.
6. Simple processes of pharmaceutical technology (measuring, sieving, mixing of powders, dilution, concentration calculation of solutions, other simple calculations needed for parmaceutical work.
7. Technical books of pharmacy. (H.Ph. VII., H.Ph.VIII., Eur. Ph. 7., FoNoVII.)
8. Tests, investigations according to the Eur. Ph. 7.
9. Connection with patients. Take part in parmacy dispensing.

Proposal for the thematic of 3rd year pharmacy students during summer practice
one month, weekly working time 35 hours, /5 days per week, daily 7 hours set

The aim of practice: To broaden theoretical and practical knowledge what students learned during the subject pharmaceutical technology. In addition, adaptation of the knowledge of basic subjects to the problems during pharmacy practice. (chemistry, physics, colloid chemistry, physiology, pharmacognosy, quality control of pharmaceutical preparations, etc.)

Tasks
1. With the guide of trainer pharmacist assessment of the magistral prescription. Form of prescriptions. Dose calculations. Preparing magistral preparations under the control of pharmacist.
2. Narcotic prescriptions.
3. Incompatibilities and magistral preparations.
4. Preparing preparations from FoNo VII. under the control of pharmacist.
5. Complete every preparation and dosage form. Practice the work of pharmacy assistent.
6. Materials knowledge.
7. Latin abbreviations commonly used in prescriptions and in the course of pharmacy work. Synonyms.
8. Calculations. Dose calculations.
9. Requirements of aseptic drug fromulations. Preparation of eye drops.
10. Take part in re-filling.
11. Take part in quality control.
12. Bandages and medical equipments.
13. Computer program
14. Patients information.

State exam practice

The state exam practice is devided into two time-period.
The first peiod is after 4th year during summer and september. (2 months)
The second period is during the second semester at 5th year. (4 months)

State exam practice for 5 th year students during the first semester
2 months
30 hours in pharmacy, /5 days per week, daily 6 hours set/,
10 hours to study professional literature
/From this period of time one month is obligatory in Hungary for students who take part in english training/

Students already took their exams from the subjects that will take part in their state exam. (Pharmacognosy, Pharmaceutical Technology, Pharmaceutical Chemistry, Pharmaceutical Management). Students may take part in every work at the pharmacy under the control of a pharmacist. e.g..Preparation of pharmaceutical dosage forms, dispensing, administration.

The practice is devided into two blocks:
- The first block is pharmacy dispensing I.,
- the second block is prescription pharmacy I.

The time period for each block is one month.

State exam practice for 5 th year students during the second semester.
4 months
30 hours in pharmacy, /5 days per week, daily 6 hours set/,
10 hours to study professional literature
3 months in accredited public pharmacy
one month in Institutional Pharmacy or Galenical laboratory

It is obligatory to choose an accredited pharmacy where magistral preparations are done. The practice is devided into four blocks. The first block is pharmacy dispensing II., the second block is prescription pharmacy II., the third block is management. These blocks are in accredited public pharmacy. The fourth block is the block of Institutional Pharmacy or Galenic Laboratory. The time period for each block is one month.

Tasks in public pharmacy

Theoretical and practical knowledge of registered drug preparations, galenicals, magistral preparations, individual prescriptions, dosage forms. Also the theoretical and practical knowledge of vaccines, immunosera, and sutures for human and veterinary use. The basic knowledge of medical aid products, equipments and machines for pharmaceutical preparations.
Basic knowledge of pharmacy management, pharmaceutical affairs organizations and juristic knowledge for pahrmacists. Pharmacy organizations.
Basic physico, chemical, physico-chemical, colloidal concepts. Knowledge of measurement conversion and the International System of Units (SI). Basic knowledge of biopharmacy, pharmacology and pharmacognosy. Control of pharmaceutical preparations. Tests and identifications for simple and compounded preparations, galenicals and herbal drugs.
Nomenclature, reading of prescriptions, materials knowledge, calculations, computer program.
Technical books of pharmacy. (H.Ph. VII., H.Ph.VIII., Eur. Ph. 7., FoNoVII.)

Tasks in Institutional Pharmacy or Galenic laboratory (fourth block)

Before the state exam students have to attend a 4 week period in Institutional Pharmacy or in Galenic laboratory. The students need to practice the medium scale pharmaceutical technology operations. Equipments and machines for medium scale pharmaceutical technology operations. Students might learn the process of special pharmaceutical dosage forms for inpatients. (e.g.: infusions, injections, individual compositions).

At the end of the practice the trainer pharmacist needs to give a qualification from the student. The student must sign this. The Comittee of the state exam will get this qualification with the student’s attendance list.

CHAPTER 15
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

Requirements for the Pharmacy Mathematics course

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:

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

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

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

6. Compulsory reading:

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

7. Rules for calculator usage during course tests and the final examination

In order to ensure a fair evaluation, to avoid disturbances in the testing room, and to protect the security of the test material the following types of calculators are NOT permitted:

- Calculators with built-in computer algebra systems (capable of simplifying algebraic expressions)
- Pocket organizers, handheld or laptop computers
- Any device capable of storing text. Calculators with a typewriter keypad (so-called QWERTY devices), electronic writing pads and pen-input devices are not allowed either. Calculators with letters on the keys (e.g. for entering hexadecimal numbers or variable names) are permitted as long as the keys are not arranged in QWERTY format
- Calculators or other devices capable of communicating with other devices
- Calculators built into wireless phones
- Calculators with paper tape or models that make noise

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

Department of Foreign Languages

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

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

2nd week:
Practical: 1st day: Kérsz egy kávét? Word formation. Plural marker. Tud/akar/szeret/szeretne gitározni. Infinitive. 2nd day: Milyen idő van ma? "-ik" group verbs. Irregular verbs in the present tense. Postán. Vasútállomáson. Mit eszünk ma este? Double negation. The negative of "van, vannak".3rd day: Tetszik a ruhád. Possessive. Az emberi test. Nekem van.4th day: Milyen szeme van?Absence of "van, vannak". Comparison. Summary. Practice.5th day: End course exam. Oral minimal requirement exam.

Requirements

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

Assessment: five grade evaluation (AW5).

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

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

Department of Foreign Languages

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

1st week:
Practical: Revision. Pretest.

2nd week:
Practical: 1. lecke Bemutatkozás 1. (Létige ismétlése).

3rd week:
Practical: 1. lecke Bemutatkozás 2.

4th week:
Practical: 2. lecke Foglalkozások 1.

5th week:
Practical: 2. lecke Foglalkozások 2.

6th week:
Practical: Revision, mid-term test

7th week:
Practical: 3. lecke: A családom 1.

8th week:
Practical: 3. lecke: A családom 2.

9th week:
Practical: 4. lecke: A testem

10th week:
Practical: 5. lecke: Kinek van… ?

11th week:
Practical: Revision. End-term test

12th week:
Practical: Oral minimum exam. Evaluation.

Requirements

Attendance

Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

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

Consultation classes: In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.
Course book: Győrffy, E.: Hogy s mint? I.
Website: Audio files to the course book, oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Department of Foreign Languages

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

1st week:
Practical: Introduction to Pharmaceutical Terminology and the Latin alphabet

2nd week:
Practical: Anatomical planes and directions

3rd week:
Practical: Pharmaceutical substances, grammatical gender in Latin

4th week:
Practical: The human body - Laitn and Greek terms

5th week:
Practical: Expressing origin and part-whole relationship - Forms and functions of the Possessive/Genitive case

6th week:
Practical: Names of chemical compounds

7th week:
Practical: Types of prescriptions, parts of prescriptions

8th week:
Practical: The human skeleton

9th week:
Practical: Latin cardinal numbers

10th week:
Practical: Pharmacy preparations and containers. The first and second declensions

11th week:
Seminar: Body regions

12th week:
Practical: Adjective formation, declension of adjectives with three endings

13th week:
Practical: Joints, joint movements

14th week:
Practical: Declension of numbers

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

Requirements

Requirements of the Latin language courses 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. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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 are added to the average score of the written tests.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

If the final score is below 60, the student once can take an oral remedial exam covering the 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:

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

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. Setting up the microscope.

2nd week:
Lecture: 3. The most important morphological and functional characteristics of fungal cell. The biotechnological importance of fungi.4. The plant cell and its most characteristic organelles.
Practical: 2. Microscopy II. The principles of phase contrast and dark field microscopy. Practicing the use of light microscope.

3rd week:
Lecture: 5. Molecular structure and function of biological membranes.6. Transport across membranes. The eukaryotic and prokaryotic cell boundary.
Practical: 3. Microscopy III. The principle of polarization microscopy. Practicing the use of light microscope.

4th week:
Lecture: 7. Endocytosis, exocytosis, cell surface receptors.8. Intracellular compartments and protein sorting.
Practical: 4. Chemical structure of proteins nucleic acids, carbohydrates and lipids and their biological significance.
Self Control Test ((In extra time.))

5th week:
Lecture: 9. The cytoskeleton: microtubules, microfilaments and intermediate filaments.10. Extracellular matrix, cell junctions and cell adhesion molecules.
Practical: 5. How cells are studied I. Basics of electron microscopic techniques. Comparison of the prokaryotic and eukaryotic cell. The structure of membranes. Transport across membranes. Study of electron micrographs.

6th week:
Lecture: 11. Cell signaling. General principles.12. Signal transduction pathways.
Practical: 6. How cells are studied II. The GERL system. Endocytosis. Cytoskeleton, cell junctions and extracellular matrix. Study of electron micrographs.

7th week:
Lecture: 13. The mitochondrion and the biological oxidation.14. The chloroplast and the photosynthesis.
Practical: 7. How cells are studied III. Metabolism,

mitochondrion and chloroplast. Study of electron micrographs.

8th week:
Lecture: 15. The cell nucleus.16. Chromatin and chromosomes.
Practical: 8. How cells are studied IV. Cell nucleus, chromatin and chromosomes. Study of electron micrographs.
Self Control Test ((In extra time.))

9th week:
Lecture: 17. The bacterial cell division.
Practical: 9. How cells are studied V. Signal transduction.

10th week:
Lecture: 18. The mechanics of cell division, mitosis.19. Meiosis and fertilization
Practical: 10. How cell are studied VI. Cell division. Study of electron micrographs.

11th week:
Lecture: 20. The regulation of the cell cycle.
Practical: 11. Isoelectric point of ovalbumin and optimum pH of the beta-galactosidase.

12th week:
Lecture: 21. Biosynthesis of the bacterial cell wall and the antibiotics that inhibit this process.
Practical: 12. How cells are studied VII. General principles of cytological staining. Ionic dyes. Staining of wool: a model experiment. Differential staining of the nucleus and cytoplasm.
Self Control Test

13th week:
Practical: 13.How cells are studied VIII. Cytochemical reactions. Detection of DNA and polysaccharides (Feulgen and PAS reactions)
Self Control Test ((In extra time.))

14th week:
Practical: 14. How cells are studied IX. Selective staining of mitochondria by enzyme-cytochemical reactions.

15th week:
Practical: 15. How cells are studied X. Immunocytochemical reactions. Demonstration of immunoglobulin producing lymphocytes. Evaluation of the semester. Examination on the use of light microscope.

Requirements

Conditions of signing the lecture book:
Concerning attendance, the rules laid out in the EER of the University are clear.
The presence of students at laboratory practices 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, 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.
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%.

End of semester examination (ESE)
There will be a written examination at the end of the first semester which covers all the material of the semester taken in the lectures, seminars, and laboratory practices (for a detailed list see the University Bulletin). The examination questions include multiple choice, and short essay questions, figures, definitions, etc. The marks are based on the student's performance, expressed in percentage (%) as shown in the table below:

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

The percentage values include the student's performance at the ESE as well as the bonus percentage they have obtained by taking the three mid-semester tests.

The following table shows the bonus percentage based on the average result of the semester tests. Absence counts as 0%.

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

(In the first semester add 2 points to the above values.)

In the second semester further bonus points can be given for the timely completion of the following midterm homeworks:

Problem solving in genetics (2 points)

Analysis of human karyograms (1 point)

Data search in human genetic databanks through the Internet (1 point)

Maximum number of the bonus points in the second semester is 14.

Final Examination (FE)

This is also a written examination at the end of the second 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). It includes cell biology and genetics. Those students, who achieve at least satisfactory (3) grade in the ESE will be exempted from cell biology. They have to take examination only in genetics. 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.

Final examination result includes the exam test score and the bonus points. Grades are given the same way as in the case of ESE.

Department of Pharmaceutical Technology

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

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

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

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

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

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

Practical: The development of physiological thinking.

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

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

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

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

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

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

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

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

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

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

Division of Inorganic and Analytical Chemistry

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

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

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

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

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

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

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

7th week:
Seminar: Exercises in stoichiometry and concentration calculations.

Practical: Heating, cooling, use of a water bath (demonstration).Purification of a benzoic acid sample contaminated with sodium-chloride. Preparation of an alum (substance #1)iron(III) ammonium sulfatepotassium aluminium sulfatepotassium chromium(III) sulfate d) zinc ammonium sulfatezinc ammonium sulfate

8th week:
Seminar: Gas laws, exercises connected to evolution of gases.
Practical: General mid-term test #1Determination of the composition of a mixture of $KClO_3$ and Kcl. Melting point measurement: the melting point of Na2 S2 O3Determination of the melting point of purified benzoic acid. Substance #1 due in.

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

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

11th week:
Seminar: Exercises in concentration calculation and redox reactions.
Practical: Preparation of a salt from its metal (substance II)lead (II) chlorideiron (II) ammonium sulfatealuminum sulfate.Studies of reactions involving gas formation or precipitation.

12th week:
Seminar: Definition of pH. Calculation of pH for strong acids and bases.
Practical: Quantitative study of a precipitation reaction. Dependence of reaction rate on the concentration of reactants. Substance #2 due in.

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

14th week:
Seminar: Electrochemical exercises. Review exercises.
Practical: General test #2.Standard electrode potentials and chemical reactions.Study of a Daniell cellReturn of equipment.

Requirements

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 or two lab practices (medical certification is needed), she or he has to participate at a make-up laboratory practice. If a student misses three 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.

Division of Inorganic and Analytical Chemistry

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

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

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

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

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

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

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

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

8th week:
Lecture: Redox reactions: Galvanic cells and the concept of electrode potential. Standard electrode potentials, oxidizing and reducing agents. Water as a redox system. Electrolysis, voltage needed in electrolytic cells, over-voltage. Quantitative laws of electrolysis. Galvanic cells and batteries.

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

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

11th week:
Lecture: Quantum mechanical model of the atom: The dual nature of matter. Heisenberg's uncertainty principle.

Schrödinger's equation and its application for the hydrogen atom. Quantum numbers and their importance. The shape of atomic orbitals. Characterization of poly-electronic atoms. Principles of the periodic table. Electronegativity, ionization energy, electronaffinity, atomic and ionic radii and their change across the periodic table.

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

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

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

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

Requirements

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

Division of Solid State Physics

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

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

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

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

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

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

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

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

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

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

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

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

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

13th week:
Lecture: Thermal physics. Temperature scales. The ideal gas. The black body radiation.

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

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

Requirements

Aim of the coures 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 situtaions to derive quantitative result, and use physical quantities properly.
Course topics

1. Kinemics, description of motion, veloxity, acceleration, path, path length

2. planar motion, projectiles, rotation, vibration.

3. Force and mass. The axioms of the Newtonian mechanics, The equation of motion, Harmonic oscillator.

4. Conserved quantities. Energy, momentum, work and potential energy,

5. Gravitastional force. Planetary motion. Kepler1s laws. Cavendish experiment. The mass of earth.

6. Ideal gas: the concept of temperature. Origin of the ideal gas law. .The law of equipartition.

7. Ellastic media, the hooks law, waves, wave propagation, wave equation, harmonic waves.

8. Wave propagation in three dimensiopns. Wave surface, refraction and interferrence. Transversal and longitudinal waves. Polaeisation.

9. The light. Propagation velocity. geometrical optics of light rays, reflection, refraction. relative and absolute index of refraction the Fermat principle.

10. Electromagnetism. Descriptive properties of the electrostatic and magnetic fields. Coulombs law.

11. Light as an electromagnetic wave, and light as a quanta. Connection between the color and the wavelength, The photon, Photoelectric effect.

12. Interaction of light and matter. Thermal radiation of the absolute black body. . The planc constant. The Broglie relation, The structure of the atom. Description of the spectrum lines.

13. The nucleon. Law of radioactive decay. binding energy and the mass defect. Description of the nuclear forces.

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

Department of Anatomy, Histology and Embryology

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

1st week:
Lecture: Covering and lining epithelia. Glandular epithelium. Connective tissues.
Seminar: Histology of epithelial tissues.
Practical: Epithelial tissuesDemonstration: 1. Endothel (small intestine, HE)2. Columnar epithelium (small intestine, brush border,HE)3. Pseudostratified epithelium with cilia (trachea, HE)4. Stratified squamos non-keratinizing epithelium (oesophagus, HE)5. Stratified squamos keratinizing epithelium (fingertip, HE)6. Sebaceous, sweat and apocrine glands (axillary skin, HE)7. Mucous and serous glands(submandibular gland, HE)

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

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

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

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

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

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

8th week:
Lecture: Anatomy of the head and neck. Nasal and oral cavities.The pharynx and the larynx.
Seminar: Anatomy of head, neck and back.
Practical: Anatomy: The anatomy of the head, neck and back Subdivisions of the skull. Calvaria and base of the skull. Sutures and fontanelles. The bony orbit, nasal cavity and paranasal sinuses. Temporomandibular, atlantooccipital and atlantoaxial joints. Overview of the anatomy of the head and neck. Sensory and motor innervation of the face. Muscles of facial expression. The parotid gland. Common carotid artery and its branches. Internal and external jugular veins. Cervical plexus. Define the location of the hyoid bone, thyroid gland and thyroid cartilage. Site of conicotomy. Surface projection of the apex of the lung. The larynx and the pharynx. The structure of the vertebral column.

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

major parts.

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

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

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

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

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

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

Requirements

Concerning attendance, the rules written in the Regulations Governing Admission, Education and Examinations of the University are valid. The presence in practices, seminars and lectures will be recorded. The head of the department may refuse to sign the Lecture Book if a student is absent more than twice from practices and seminars in one semester even if he/she has an acceptable reason.

The program of the lectures, seminars and practices are written in the University Calendar.

Rules of examinations:

Midterm examinations:

Two midterm examinations will be held, one on the 7th week and the other on the 15th week. The exams cover the topics of lectures, seminars and practices of the second semester.

Evaluation of the midterm examinations

The midterm exams will be evaluated with points and the points of the two examinations will be added. Students with scores higher than 60% earn an exemption from the final examination with a mark that will be calculated on the basis of the overall performance on the two midterm examinations.

End-semester exam

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

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

Registration for the exam and postponement: Through the NEPTUN system

Department of Biophysics and Cell Biology

Subject: **BIOPHYSICS**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **15**
Seminar: **13**
Practical: **16**

1st week:
Lecture: Electromagnetic waves, interaction with absorbing material. Thermal radiation. Generation of X-ray, braking and characteristic radiation. Interpretation of X-ray absorption.

2nd week:
Lecture: Lasers and their application in medicine.

3rd week:
Lecture: Radiation biophysics. Isotopes. Radioactive disintegration. Features of nuclear radiation and its interaction with absorbing material. Target theory, dose-effect curves. Theory of activation of water, indirect action of radiation. Radiation sensitivity.
Practical: Practical introduction.

4th week:
Lecture: Sedimentation, velocity and equilibrium method. Gel-electrophoresis, isoelectric focusing, blotting techniques.
Seminar: Biostatistics. Probability theory. Set theory. Random events. Conditional probability, marginalization. Independent events.
Practical: Practices are performed by subgroups of 4-5 students on the weeks 4-9.1st practiceP1: Computer tomography (CT). Blood pressure measurement.P2: Spectrofluorimetry. P3: Measurement of the diffusion constant.P4: Measurements with a Geiger-Müller counter. Attenuation of nuclear radiation.P5: Measurements with microscopes

5th week:
Lecture: Fluorescence, phosphorescence. Fluorescencepolarization, anisotropy, application of fluorescencetechniques. Fluorescence resonance energy transfer.
Seminar: Biostatistics. Random variable. Cummulative distribution function, distribution function of random variable. Mean, standard deviation.
Practical: 2nd practice

6th week:
Lecture: Membrane transport. Diffusion, Fick's I. and II. law, thermodiffusion, facilitated diffusion.
Seminar: Biostatistics. Discrete probability distributions: binomial and Poisson-distribution.
Practical: 3rd practice

7th week:
Lecture: Imaging systems used in medical diagnosis. Gamma camera, PET and SPECT. Principles of Computer Tomography (CT).
Seminar: Biostatistics. Continuous probability distribution. Normal distribution. Standard normal distribution. Sampling.
Practical: 4th practice

8th week:
Lecture: Therapeutic use of electricity. Electric stimulus therapy, pacemaker, defibrillator. Heat therapy, electric surgery.
Seminar: Biostatistics. Hypothesis testing. Null hypothesis. Statistical significance. z-test.
Practical: 5th practice

9th week:
Lecture: Osmosis. Biological importance, molecular structure and characteristics of water.
Seminar: Biostatistics. Paired, unpaired t-test, F-test.
Practical: Spare lab

10th week:
Lecture: Membrane biophysics. The structure of biological membranes. Fluidity. Mobility of proteins and lipids (lateral and rotational diffusion) and its functional importance in the membrane. Model membranes. Molecular structure of the lipid bilayer.
Seminar: Biostatistics final test.
Practical: Practical exam.

11th week:
Lecture: Electrical properties of the plasma membrane, electrochemical potential, Donnan equilibrium, Nernst equation. Passive and active transport. Diffusion potential.

12th week:
Lecture: Structure of ion channels, gating and selectivity. Ionophore antibiotics in ion transport research. Measurement of bioelectric activities, resting and action potential. Electrophysiology at single channel level. Patch-clamp technique.

13th week:
Lecture: Biophysics of the sensory organs. Stimulus, types of receptors; photo-, mechano-, electro-, and chemoreceptors. Function of photoreceptors, color vision. The mechanism of hearing, sound, intensity of sound. Weber-Fechner law. Electrical properties of auditory receptors. Coding of acoustic information.

14th week:
Lecture: Generation and properties of ultrasound. Ultrasound imaging. Practical applications of the Doppler effect.

15th week:
Lecture: Basics of information theory. Regulation and control. Feedback mechanisms.

Requirements

1. 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. Some new concepts and ideas are discussed in the lectures only and are not present in the textbook.

2. Seminars
Attendance to seminars is obligatory. With acceptable excuse the students may miss maximum 2 (two) seminars. In the seminars, students are encouraged to ask questions related to the topic of the lectures discussed (see timetable of lectures and seminars).

3. Practical
Attendance to labs is mandatory. Labs missed with acceptable excuse can be completed during the spare practical or at a different group with the written permission (recorded in the lab logbook) of the lab supervisor (more than one absences). In the latter case only presence is signed by the lab teacher, the work performed is to be graded by the students' own lab teacher. A separate lab logbook should be prepared (A4, cross-hatched, bound). The first page of the logbook should have a table with "date", "title of the practical", "signature for presence" and "evaluation" column headers. For each lab students must write a short summary of the background for the practical to be performed into the logbook, outline the measurements to be made and prepare the tables for entering the measured data. The lab tutor may test the students' preparation for the practical and based on this the tutor might instruct the student to repeat the lab (scheduling is the same as for absences). All data must be entered directly into the logbook, no lose sheets and lab guides are accepted. The lab, including calculations and graphs, has to be finished by the end of the class. Logbooks will than be graded on the spot (0-5, 0 means that the lab is not accepted and the given lab must be repeated). At the end of the semester, the grades for your logs and your attitude during labs will be summed up as a Practical Grade (PG) on a scale of 0-5.
Practical exam. Its duration is 1 hr and you have to perform an experiment based on the semester work, assigned randomly. The students can use their own logbook, but no other material. The grading will be on a scale of 0-5 (PE grade) based on the log of this experiment (concept, work plan, clarity and punctuality are primary consideration).

4. Conditions for signing the lecture book
1. Less than 2 absences from seminars.
2. All labs accepted.
3. Practical part is accepted.

Special issues regarding the biostatistics test: Those who pass this test are exempted from the biostatistics part of the final exam. Unsuccessful students are obliged to answer first the biostatistics questions of the final exam.

5. Final Examination (FE)
Dates, sites and detailed instructions for the FE will be announced on the bulletin board of the Department of Biophysics and Cell Biology (theoretical building, ground floor /level of main lecture hall/), and / or posted on the door of the biophysics student lab.

Department of Foreign Languages

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

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

2nd week:
Practical: Pretest

3rd week:
Practical: 6. lecke Melyik a jobb? 1.

4th week:
Practical: 6. lecke Melyik a jobb? 2.

5th week:
Practical: 7. lecke Napirend 1.

6th week:
Practical: 7. lecke Napirend 2.

7th week:
Practical: Revision. Mid-term test

8th week:
Practical: 8. lecke Szabadidő 1.

9th week:
Practical: 8. lecke Szabadidő 2.

10th week:
Practical: 9. lecke Hol voltál tegnap? 1.

11th week:
Practical: 9. lecke Hol voltál tegnap? 2.

12th week:
Practical: 10. lecke Mit csináltál tegnap? 1.

13th week:
Practical: 10. lecke Mit csináltál tegnap? 2.

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. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

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

Consultation classes

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

Course book: See the website of the department.

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

Department of Foreign Languages

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

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

2nd week:
Practical: Muscles

3rd week:
Practical: Comparision of adjectives, prefixes and prepositions

4th week:
Practical: Latin conjugation

5th week:
Practical: The digestive system

6th week:
Practical: Routes of drug administration. Participles. The fourth and fifth declension.

7th week:
Practical: Prescriptions related to the GI tract.

8th week:
Practical: The respiratory system.

9th week:
Practical: Medicines of the respiratory system

10th week:
Practical: Latin diminutives. The skin.

11th week:
Practical: Dermatological problems and skin preparations.

12th week:
Practical: The cardiovascular system.

13th week:
Practical: Blood and blood vessels. Pharmacology of the cardiovascular system.

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

15th week:
Practical: Evaluation.

Requirements

Requirements of the Latin language courses 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. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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 are added to the average score of the written tests.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

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

Consultation classes

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

Coursebook: Takácsné Tóth Emőke: Latin for Pharmacy Students II.

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

Department of Human Genetics

Subject: **PHARMACEUTICAL BIOLOGY II.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **35**
Practical: **30**

1st week:
Lecture: 1. Introduction to molecular genetics and genomics Hartl: Essential genetics Ch. # 12. Molecular organization of chromosomes in prokaryotes and eukaryotes. Hartl: E. Genetics Ch. # 33. Cytogenetics I. Karyogram, ideogram, banding techniques. Human autosomal trisomies. Hartl: Essential genetics Ch. # 5
Practical: 1. General informations on the subject. Seminar in mendelian genetics.

2nd week:
Lecture: 4. Cytogenetics II. Abnormalities of the X and Y chromosomes. Structural aberrations of human chromosomes. Genomic imprinting. Uniparental disomy Ch. # 55. Cytogenetics III. Sex determination in humans. Molecular cytogenetics. Ch. # 5, Lecture slides on departmental homepage.6. The structure of genes Ch. # 8
Practical: 2. Selected topics in mendelian genetics.

3rd week:
Lecture: 7. The function of genes. Gene expression. Ch. # 88. Bacterial genetics. gene regulation in prokaryotes Ch # 7 , 9.1, 9.2, 9.3 Extranuclear inheritance Ch # 14.109. Gene regualtion in eukaryotes Ch # 9
Practical: 3. Pedigree analysis. Practical Courses in Genetics pp. 35 - 44 Problems in Mendelian genetics (homework).

4th week:
Lecture: 10. Genomics, proteomics and the human genome project. Ch # 10 and lecture notes on the departmental homepage11. Transmission genetics. Genes and alleles. Genotype and phenotype. Monohybrid cross. Mendel's 1st law. Reciprocal cross and test cross. Autosomal and X-linked genes. Ch # 212. Dihybrid cross. Mendel's 2nd law. Different types of inheritance. Gene interactions, epistasis, lethal genes. Multiple alleles. Ch # 2
Practical: 4. Evulation of genetic crosses. Problems is Mendelian genetics.
Self Control Test (in extra time.)

5th week:
Lecture: 13. Dominant and recessive genes: a molecular view. Extranuclear inheritance. Hartl: E. Genetics Ch # 2 and 14.1014. The genetic basis of complex inheritance. Ch. # 1515. The genetic role of RNA. Relevant pages: 27, 90-92, 155-156, 271-272, 275, 319-320, 353-354, 360-361 in Hartl: E. Genetics and lecture notes on departmental homepage.
Practical: 5. Seminar on human cytogenetics. Ananlysis of human karyograms (homework).

6th week:
Lecture: 16. Mutation and repair Ch. # 1217. Human genetic diversity. DNA polymorphism Ch. # 4.4, 14.4 and lecture notes18. Human genetic diversity. Genetics of blood types and MHC. Hartl: E. Genetics. Ch. # 2 and lecture notes on departmental homepage
Practical: 6. Seminar on molecular genetics. Gene structure and function. The use of human genetic databases through the Internet. (homework).

7th week:
Lecture: 19. The molecular, biochemical and cellular basis of genetic disease. I. 20. T The molecular, biochemical and cellular basis of genetic disease. II. Lecture notes on

departmental homepage.21. Population genetics. Ch # 14
Practical: 7. Seminar of gene regulation and bacterial genetics.

8th week:
Lecture: 22. The treatment of genetic disease Ch # 10 and lecture notes23. Cancer genetics and genomics Ch # 1324. Pharmacogenetics, pharmacogenomics. Ecogenetics, ecogenomics. lecture notes
Practical: 8.Seminar on recombinant DNA.

9th week:
Practical: 9.Seminar on developmental genetics.
Self Control Test (In extra time.)

10th week:
Lecture: 25. Human gene mapping and disease gene identification. I.26. Human gene mapping and disease gene identification. II. Ch 4 and lecture notes27. Genetic control of development I. Ch 11 and lecture notes
Practical: 10. Seminar on oncogenetics.

11th week:
Lecture: 28. Bacterial genetics. Ch # 729. Prenatal diagnosis. Personalized medicine. Lecture notes.30. Genetic counseling and ethical issues. Lecture notes
Practical: 11. Demonstration of the human X chromatin. Demonstration of mammalian chromosomes. Laboratory Manual pp. 7-25.

12th week:
Lecture: 31-32. Review seminar on classical and cytogenetics.
Practical: 12. Complementation test. The gene concept. Practical courses in genetics. Pp. 53-58.

13th week:
Lecture: 33-34. Review seminar on molecular genetics.
Practical: 13. Transformation of E. coli by a plasmid vector conferring antibiotic resistance. Laboratory Manual pp. 59-65. Cleavage of DNA with restriction endonucleases. Laboratory Manual pp. 79-83.
Self Control Test (in extra time.)

14th week:
Practical: 14. Detection of human polymorphism by polymerase chain reaction. Laboratory Manual pp. 85 - 89. and handout from the homepage.

15th week:
Practical: 15. Induction of beta-galactosidase in E. coli cells. Operons. Laboratory manual pp. 53-58.Evaluation of the semester. General consultation.

Requirements

Conditions of signing the lecture book:

Concerning attendance, the rules laid out in the EER of the University are clear.

The presence of students at laboratory practices 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, the semester will be accepted only if they pass an examination based on the material covered by the laboratory classes of the semester (lab test). Missed laboratory classes may only be made up for in the classes with other groups in the same week. For permission to make up a missed laboratory class please consult the academic advisor.

There will be 3 homeworks during the semester. The submission is optional. Students may earn bonus points with the correct solution and timely submission of homeworks.

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.

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%.

End of semester examination (ESE)

There will be a written examination at the end of the first semester which covers all the material of the semester taken in the lectures, seminars, and laboratory practices (for a detailed list see the University Bulletin). The examination questions include multiple choice, and short essay questions, figures, definitions, etc. The marks are based on the student's performance, expressed in percentage (%) as shown in the table below:

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

The percentage values include the student's performance at the ESE as well as the bonus percentage they have obtained by taking the three mid-semester tests.

The following table shows the bonus percentage based on the average result of the semester tests. Absence counts as 0%.

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

(In the first semester add 2 points to the above values.)

In the second semester further bonus points can be given for the timely completion of the following midterm homeworks:

Problem solving in genetics (2 points)

Analysis of human karyograms (1 point)

Data search in human genetic databanks through the Internet (1 point)

Maximum number of the bonus points in the second semester is 14.

Final Examination (FE)

This is also a written examination at the end of the second 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). It includes cell biology and genetics. Those students, who achieve at least satisfactory (3) grade in the ESE will be exempted from cell biology. They have to take examination only in genetics. 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.

Final examination result includes the exam test score and the bonus points. Grades are given the same way as in the case of ESE.

Division of Inorganic and Analytical Chemistry

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

1st week:
Practical: Inorganic and analytical laboratory rules (exposition).Laboratory safety (exposition).Distribution of laboratory equipment. Reaction of potassium chlorate with red phosphorus (demonstration).Reaction of hydrogen sulfide with sulfur dioxide (demonstration).Preparation of solutions of ammonium sulfide and polysulfide The decomposition of polysulfide (demonstration)Laboratory preparation of hydrogen with the use of Kipp-apparatus and comsution of hydrogen.

2nd week:
Practical: Laboratory preparation of chlorine and its reaction with metals (team study).Preparation of chlorine by reating NaClO (hypo) with HCl (reading)Reaction of alkali-chlorides, -bromides and ioidides with concentrated (cc) H2SO4 Reactions of hypochlorite ion. Laboratory preparation of oxygen gas (reading).Combustion of elements in oxygen (reading).Reactions of hydrogen peroxide. Preparation and reactions of hydrogen sulfide.Chemical properties of sulfurous and sulfuric acid.

3rd week:
Practical: Laboratory preparation of nitrogen. Chemical properties of ammonia, oxidation of NH3 by halogens (team study).Preparation and study of nitrogen monoxide (team study).Preparation and chemical properties of nitric acid and nitrates. Experiments with phosphorus and with phosphorus pentoxide.

4th week:
Practical: Properties of carbon dioxide (team study). Preparation, properties and study of carbon monoxide (team study)Experiments with boric acid and reactions of borate ion. Reactions of alkali and alkaline earth metals with water (team study). Solution of alkali and alkaline earth metals in liquid ammonia (demonstration). Interaction of aluminum, lead and tin with acids and alkalies. Interaction of iron, copper and zinc with acids and alkalies.

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 potassium bromide.

6th week:
Practical: The analysis of anion group II (phosphate, sulfate, fluoride, bromate and iodate ions).The analysis of anion group III (chloride, bromide and iodide ions).Removal of orthophosphate ions from aqueous solutions (team study)."Eaching test" (demonstration) Unknown sample: Detection of an anion of group I-II in a solid salt of an alkali metal (CO_3^{2-} ; HCO_3^-; S^{2-} ; SO_3^{2-} ; SO_4^{2-} ; PO_4^{3-} (HPO_4^{2-} ; $H_2PO_4^-$); F^- ; BrO_3^- ; IO_3^{--}). 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 (CO_3^{2-}; S^{2-} ; SO_3^{2-}; SO_4^{2-}; PO_4^{3-}(HPO_4^{2-} ; H_2PO^{4-}); F^- ; BrO^{3-} ; IO^{3-} ; Cl^- ; Br^-; I^-; $SO_3^{2-}$and SO_4^{2-} ions do not co-exist).Voluntary test: Detection of one or two anions of group I-III in a solution of two alkali metal salts (CO_3^{2-}; S^{2-} ; SO_3^{2-}; SO_4^{2-}; PO_4^{3-}(HPO_4^{2-} ; H_2PO^{4-}); F^- ; BrO^{3-} ; IO^{3-} ; Cl^- ; Br^-; I^-; $SO_3^{2-}$and SO_4^{2-} ions do not co-exist).

8th week:
Practical: The analysis of anion group IV (nitrite, nitrate and chlorate ions).Detection of nitrite and nitrate ions with Griess-Ilosvay reagent Unknown sample: Detection of two anions of group I-IV in a mixture of two alkali metal salts (CO_3^{2-}; S^{2-}; SO_3^{2-}; SO_4^{2-}; PO_4^{3-} (HPO_4^{2-};.$H_2PO_4^-$); F^-; BrO_3^-; IO_3^-; Cl^-; Br^-; I^-; NO_2^- and NO_3^-). The pairs of : SO_3^{2-} - SO_4^{2-} ; Br^- - NO_3^- and I^- - NO_3^- 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 IIA (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 IIA in a solution (Ag^+; Cd^{2+}; Hg_2^{2+}; Hg^{2+}; Pb^{2+}; Bi(III) (Hg_2^{2+} - Hg^{2+} and Cu^{2+} - Hg_2^{2+} ions are not given together)Voluntary test : Detection of one or two cations of group I and IIA in solution (Hg_2^{2+} - Hg^{2+} and Cu^{2+} - Hg_2^{2+} ions are not given together).

11th week:
Practical: The analysis of cation group IIB (Arsenic(III), arsenic(V), antimony(III), antimony(V), tin(II) and tin(IV).Reactions of permanganate, chromate and dichromate ions Oxydation states of transition metals belonging to 3d row in aqueous solutions Use of organic reactions in analysisPurity test : Investigation of iron impurity in citric acid.

12th week:
Practical: The analysis of cation group III: (Nickel(II), cobalt(II), iron(II), iron(III), manganese(II), chromium(III), zinc(II) and aluminium(III) ions)."Fluoride test" for aluminium (demonstration).Detection of traces of nickel in cobalt salts.Preparation and properties of cyanide complexes of some transition metal ions. Unknown sample: Detection of two cations of group III in solution (The oxidation state of Fe and Cr can be +3, and the oxidation state of Mn can be +2 only).Voluntary test : Detection of one or two cations of group III in solution (The oxidation state of Fe and Cr can be +3, and the oxidation state of Mn can be +2 only).

13th week:
Practical: The analysis of cation group IV (calcium(II), strontium(II) and barium(II) ions).The analysis of cation group V (magnesium(II), lithium(I), sodium(I), potassium(I) and ammonium ions).Detection of traces of ammonia (demonstration).Reaction of Sr^{2+} and Ba^{2+} ions with sodium rhodizonate Salts of alkali metal ions with poor solubility of water Unknown sample: Detection of two cations of group I, IIA, III, IV or V in solution (One component is a cation of group I, IIA or III (Cu^{2+}; Ag^{+}; Cd^{2+}; Hg_2^{2+}; Hg^{2+}; Pb^{2+}; Bi(III); Ni^{2+}; Co^{2+}; Fe^{2+}; Fe^{3+}; Mn^{2+}; Cr^{3+}; Zn^{2+}; Al^{3+}) and the other one is a cation of group IV or V (Ca^{2+}; Sr^{2+}; Ba^{2+}; Li^{+}; Na^{+}; K^{+}; NH_4^{+}).. 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 (Cu^{2+}; Ag^{+}; Cd^{2+}; Hg^{2+}; Pb^{2+}; Bi(III); Ni^{2+}; Co^{2+}; Fe^{3+}; Mn^{2+}; Cr^{3+}; Zn^{2+}; Al^{3+}; Ca^{2+}; Sr^{2+}; Ba^{2+}; Li^{+}; Na^{+}; K^{+}; NH_4^{+}), but Mg^{2+} 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 : CO_3^{2-} (HCO_3^{-}) ; SO_4^{2-} ; PO_4^{3-} (HPO_4^{2-}; $H_2PO_4^{-}$); F^{-}; Cl^{-}; Br^{-}; I^{-}; NO_3^{-} 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.

Division of Inorganic and Analytical Chemistry

Subject: **INORGANIC AND QUALITATIVE ANALYTICAL CHEMISTRY THEORY**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **45**

1st week:
Lecture: Elements in the periodic table. Classification of the elements. Production of the elements by separation and by chemical (metallurgical) methods. Preparation of the non-metallic elements by oxidation. Reduction of metal oxides by carbon, hydrogen or metals. Thermal decomposition of metal-halides and carbonyls. Preparation and purification of metals by electrolysis. Hydrogen. Atomic and physical properties, abundance, chemical properties. Deuterium and tritium. Production and uses. The Noble gases. (Group 18). Atomic and physical properties, distribution, chemical properties. Clatrates, ionic and covalent compounds. Production and uses.

2nd week:
Lecture: The halogens. (Group 17) Atomic and physical properties, distribution, chemical properties of the halogens. Interhalogens. Hydrogen halides, oxides and oxoacids. Structure and acidity of the oxoacids. Preparation and uses. The chalcogens. (Group 16). Atomic and physical properties, distribution, chemical properties of the chalcogens. Compounds with hydrogen and halogens. Water and softening of water. Oxides and oxoacids of chalcophylic elements. Sulphur-nitrogen compounds. Production and uses of the elements.

3rd week:
Lecture: Nitrogen, phosphorus, arsenic, antimony and bismuth (Group 15). Atomic and physical properties, distribution, chemical properties of the elements. Typical compounds, comparison of the stereochemistry of nitrogen and phosphorus. Hydrides, preparation and uses of ammonia. Structure, chemical properties of the oxides and oxoacids. Production and uses of the elements.

4th week:
Lecture: Carbon, silicon, germanium, tin and lead (Group 14). Atomic and physical properties, distribution, chemical properties of the elements. Chemistry of carbon and silicon. Typical compounds, the stereochemistry of carbon. Important compound of silicon. Oxides, oxoacids and related compounds. Carbon-nitrogen compounds, carbides. Production and uses of the elements.

5th week:
Lecture: Boron, aluminium, gallium, indium and thallium (Group 13). Atomic and physical properties, distribution, chemical properties of the elements. Structure and chemical properties of EX_3 compounds. 3-centre bonding. Boron hydrides, binary and ternary hydrides of Al. Oxides and related compounds. Production and uses of the elements.

6th week:
Lecture: Introduction to qualitative analysis (This topic is partially worked up during the seminars). Short history of the analytical chemistry. Basic experimental methods in analytical chemistry. Classification of chemical reactions in analytical chemistry: acid-base, redox and complexation reactions, reactions with colour changes and precipitation. Specific, and selective reactions. Sensitivity. Preparation and homogeneity of the samples. Dissolution of solid samples. Classifications of the cations and anions based on inorganic chemical considerations. Types of sulphides. Tioacids, tiobasics and tiosalts. Introduction to coordination chemistry. Equilibria, stability correlations. Classifications of the complexes and ligands. Hard-soft theory and its application in analytical chemistry. Anions. Group 1. and 2: carbonate, bicarbonate, silicate, sulphide, poly-sulphide, sulphite, tiosulphate, hypoclorite; and borate, phosphate, sulphate, fluoride, bromate, iodate. Groups 3 and 4: chloride, bromide, iodide, cyanide, tiocyanide; and nitrite, nitrate, acetate, chlorate, perchlorate, peroxide.

7th week:
Lecture: Systematic analysis of cations. The Fresenius system. Reactions and separation of Group 1 and 2A cations: Ag(I), Pb(II), Hg(I), Cu(II), Hg(II), Bi(III), Cd(II). Reactions and separation of Group 2B 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: natrium -, kalium -, and litium ions, Mg(II) and ammonium ions. Complete analysis of cations. Separation methods in the qualitative analysis.

8th week:
Lecture: S-block elements (Group 1 and 2): Atomic and physical properties, distribution, chemical properties and uses of the alkali and alkaline earth metals. Dissolution of Na in liquid ammonia. Covalent and coordination compound of the alkali metal elements. Crown ethers and cryptands. Compounds of alkaline earth metals: hydrides, halogenides, oxides, hydroxides, salts with strong acids, complexes. The Grignard reagent.

9th week:
Lecture: Transition metals (d-block elements, Group 3 -12): General trend in the d-block. Electronic structure, oxidation state, atomic and ionic size. Horizontal and

vertical similarities in the d-block. Atomic and physical properties, distribution, chemical properties and uses of the transition metals. Compounds: hydrides, halogenides, oxides, hydroxides, salts with strong acids, complexes. Acid-base properties and redoxy reactions. Transition metal ions in aqueous solutions: hydrated cations, oxocations and oxoanions. Iso and heteropolyacids. Carbonyls. Organometallic compounds.

10th week:
Lecture: Titanium, Zirconium and Hafnium. Atomic and physical properties, distribution, chemical properties and uses of the elements. Halogenids and oxides. $TlCl_4$, TiO_2, ZrO_2. Vanadium, Niobium and Tantalum. Atomic and physical properties, distribution, chemical properties and uses of the elements. Halogenides as cluster compounds. Oxides and related compounds. Chromium, Molybdenum and Tungsten. Atomic and physical properties, distribution, chemical properties and uses of the elements. Halogenides and oxides. Iso and heteropolyacids. Some Cr(III) compounds. Manganese, Technetium and Rhenium. Atomic and physical properties, distribution, chemical properties and uses of the elements. Important compounds of manganese. 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. Chemistry of photography. Copper, Silver and Gold. Atomic and physical properties, distribution, chemical properties and uses of the elements. Zinc, Cadmium and Mercury. Atomic and physical properties, distribution, chemical properties, production and uses of the elements. Halogenides, oxides, sulphides and coordination compounds.

11th week:
Lecture: Same as the 10th week's lecture.

12th week:
Lecture: f-block elements. Electronic structure, the lanthanide contraction. Some important complexes of Gd. Important uranium compound related to the atomic energy industry.

13th week:
Lecture: Introduction to the bioinorganic chemistry. Essential and toxic elements in biologic systems. Classification of the biological functions of the essential elements. Complex forming properties of the biologically important ligands. Experimental methods for chemical and biological studies. Biological functions of the essential elements. Transport and activation of the small biomolecules. Metalloenzymes, metalloproteins. Important examples, enzyme models. Distribution of cations, transport processes, ion uptake through the membrane.

14th week:
Lecture: Biological functions of alkali metal ions. Role of natrium- and kalium ions in controlling the membrane potential and in activation of enzymes. Biological functions of alkaline earth metal ions. Role of calcium ion in operation of muscles and enzymes. Calcium ion and mineralization in the body. Role of magnesium ion in enzymes and in the photosynthesis. Transition metals and other elements. Transport, storing and activation of oxigen. Role and metabolism of iron. Copper containing proteins and metabolism of copper. Biological role of zinc in activation of enzymes. Importance of Mo, Se and silicon. Medical applications. Toxicity of heavy metals. Complexes and ligands as pharmaceuticals.

Requirements

Exam: written test

Division of Organic Chemistry

Subject: **ORGANIC CHEMISTRY PRACTICE I.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Seminar: **14**
Practical: **42**

1st week:
Seminar: Receiving of laboratory equipments, safety education. Crystallization from water and organic solvent. Controlling of purity by thin-layer chromatography (TLC), and determination of melting point. Filling in of laboratory notes.
Practical: Receiving of laboratory equipments, safety education. Crystallization from water and organic solvent. Controlling of purity by thin-layer chromatography (TLC), and determination of melting point. Filling in of laboratory notes.

2nd week:
Seminar: Isolation of nicotine from tobacco leaves. Isolation of piperine from black pepper. Vacuum and simple distillation. Filling in of laboratory notes.

Practical: Isolation of nicotine from tobacco leaves. Isolation of piperine from black pepper. Vacuum and simple distillation. Filling in of laboratory notes.

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

4th week:
Seminar: Separation of acetanilide and m-dinitrobenzene by column chromatography. Identification of hydrocarbons. Filling in of laboratory notes.
Practical: Separation of acetanilide and m-dinitrobenzene by column chromatography. Identification of hydrocarbons. Filling in of laboratory notes.

5th week:
Seminar: Identification of organic halides. Preparation and purification of terc-butyl-chloride. Filling in of laboratory notes.
Practical: Identification of organic halides. Preparation and purification of terc-butyl-chloride. Filling in of laboratory notes. Deposite the laboratory equipments.

Requirements

Conditions on signing the lecture book: The laboratory work is evaluated by a five-level practical grade. Prerequisite: General Chemistry Theory and Practice.
The Organic Chemistry Seminar and Laboratory Practice will be kept in three groups. Each group will exercise for 5 weeks.

Division of Organic Chemistry

Subject: **ORGANIC CHEMISTRY THEORY I.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: History of organic chemistry. Description of hetero- and homo-nuclear bonds of organic compounds.

2nd week:
Lecture: MO and VB theory of the chemical bond.

3rd week:
Lecture: Constitution, configuration and con-formation of organic compounds, stereo-chemical definitions. Chirality, optical activity. Properties of optically active compounds. Classification of organic compounds and their nomenclature.

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

5th week:
Lecture: Structure elucidation of organic compounds. Principles of spectroscopic methods.

6th week:
Lecture: Structure and isomerism of alkane-sand cycloalkanes. Steroids.

7th week:
Lecture: Preparations and reactions of alkanes and cycloalkanes.

8th week:
Lecture: Characterization of alkenes, their reactions and preparations.

9th week:
Lecture: Characterization of dienes, polienes, allylic compounds and their reactions and preparations.

10th week:
Lecture: Characterization of alkynes, their preparations and reactions. Classification of aromatic compounds.

11th week:
Lecture: Definition of aromacity, reactions of aromatic compounds. Theory of aromatic electrophilic substitution.

12th week:
Lecture: Effect of susbstituent on electrophilic aromatic substitution.

13th week:
Lecture: Policyclic aromatic compounds.

14th week:
Lecture: Properties, synthesis and preparation of alkyl halides.

15th week:
Lecture: Nucleophilic substitution and elimination of alkyl halides.

Requirements

Lecture = terminal examination.

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

Subject: **PHYSICAL CHEMISTRY I.**
Year, Semester: 1st year/2nd semester
Number of teaching hours:
Lecture: **30**
Seminar: **15**

1st week:
Lecture: Basic notions of thermodynamics. System, surroundings, state variables, state equation. Perfect and real gases. Open, closed and isolated systems. Homogeneous, inhomogeneous and heterogeneous systems. Homogeneous and heterogeneous mixtures. Phase space, path, state function, process quantity. Velocity and energy distributions of the gas molecules.
Seminar: Basic notions of thermodynamics. System, surroundings, state variables, state equation. Perfect and real gases. Open, closed and isolated systems. Homogeneous, inhomogeneous and heterogeneous systems. Homogeneous and heterogeneous mixtures. Phase space, path, state function, process quantity. Velocity and energy distributions of the gas molecules.

2nd week:
Lecture: First law of thermodynamics. Work, heat, internal energy, enthalpy. Conservation of energy, the first law. Heat capacities, special processes. Standard reaction enthalpy, standard enthalpy of formation, Hess theorem.
Seminar: First law of thermodynamics. Work, heat, internal energy, enthalpy. Conservation of energy, the first law. Heat capacities, special processes. Standard reaction enthalpy, standard enthalpy of formation, Hess theorem.

3rd week:
Lecture: The second and third laws of thermodynamics. Various formulations of the second law, the direction of natural processes, irreversibility. Entropy, potential functions, Gibbs and Helmholtz functions. Heat engines and refrigerators. The behaviour of substances at low temperatures, the unattainability of the absolute zero. Statistical mechanics aspects of the second and third laws.
Seminar: The second and third laws of thermodynamics. Various formulations of the second law, the direction of natural processes, irreversibility. Entropy, potential functions, Gibbs and Helmholtz functions. Heat engines and refrigerators. The behaviour of substances at low temperatures, the unattainability of the absolute zero. Statistical mechanics aspects of the second and third laws.

4th week:
Lecture: Phase equilibria of pure substances. Vaporization, fusion, sublimation and allotropic (polymorphic) transformations. The Clapeyron and Clausius–Clapeyron equations. Phase diagrams, Gibbs phase rule. Saturated vapour pressure of curved surfaces.
Seminar: Phase equilibria of pure substances. Vaporization, fusion, sublimation and allotropic (polymorphic) transformations. The Clapeyron and Clausius–Clapeyron equations. Phase diagrams, Gibbs phase rule. Saturated vapour pressure of curved surfaces.

5th week:
Lecture: Homogeneous mixtures 1. Ideal and real mixtures, partial molar quantities, chemical potential. The activity. Raoult's and Henry's laws. Pressure and boiling point vs. composition diagrams for liquid mixtures and distillation.
Seminar: Homogeneous mixtures 1. Ideal and real mixtures, partial molar quantities, chemical potential. The activity. Raoult's and Henry's laws. Pressure and boiling point vs.composition diagrams for liquid mixtures and distillation.

6th week:
Lecture: Homogeneous mixtures 2. The temperature and pressure dependence of the activity of saturated solutions. Colligative properties. Freezing point vs. composition diagrams, partition equilibrium. Electrolyte solutions and their activity, the Debye—Hückel limiting law.
Seminar: Homogeneous mixtures 2. The temperature and pressure dependence of the activity of saturated solutions. Colligative properties. Freezing point vs. composition diagrams, partition equilibrium. Electrolyte solutions and their activity, the Debye—Hückel limiting law.

7th week:
Lecture: Chemical equilibrium. The minimum of Gibbs energy in reactive systems at constant pressure and temperature, reaction Gibbs energy, equilibrium constant. Temperature and pressure dependence of equilibrium constant. Le Chatelier--Braun principle. Heterogeneous

and solution equilibria.
Seminar: Chemical equilibrium. The minimum of Gibbs energy in reactive systems at constant pressure and temperature, reaction Gibbs energy, equilibrium constant. Temperature and pressure dependence of equilibrium constant. Le Chatelier--Braun principle. Heterogeneous and solution equilibria.

8th week:
Lecture: Transport phenomena. Notion, temperature dependence and measurement of viscosity, Stokes formula. Notions of diffusion and convection, their fluxes and differential equations. Notion, flux and differential equation of heat conduction. Heat conduction in mixtures and solids. Other forms of heat propagation.
Seminar: Transport phenomena. Notion, temperature dependence and measurement of viscosity, Stokes formula. Notions of diffusion and convection, their fluxes and differential equations. Notion, flux and differential equation of heat conduction. Heat conduction in mixtures and solids. Other forms of heat propagation.

9th week:
Lecture: : Electrical conduction of electrolyte solutions. Conductivity and molar conductivity of electrolyte solutions, their concentration dependence. Kohlrausch law and law of independent migration of ions. Ionic movement in solutions, ionic mobility. Ostwald dilution law. Transference number.
Seminar: : Electrical conduction of electrolyte solutions. Conductivity and molar conductivity of electrolyte solutions, their concentration dependence. Kohlrausch law and law of independent migration of ions. Ionic movement in solutions, ionic mobility. Ostwald dilution law. Transference number.

10th week:
Lecture: Galvanic cells and electrodes. Structure and diagram of galvanic cells, cell reaction, cell potential, electromotive force. Thermodynamics of galvanic cells. Concentration cells. Liquid-liquid junction potentials. Electrode potential, types of electrodes.
Seminar: Galvanic cells and electrodes. Structure and diagram of galvanic cells, cell reaction, cell potential, electromotive force. Thermodynamics of galvanic cells. Concentration cells. Liquid-liquid junction potentials. Electrode potential, types of electrodes.

11th week:
Lecture: Electrolysis, practical galvanic cells and corrosion. Electrolysis, decomposition voltage, overpotential. Faraday laws. Practical galvanic cells, Leclanché cell, lead-acid cell. Corrosion, oxide layers, local galvanic cells, corrosion protection.
Seminar: Electrolysis, practical galvanic cells and corrosion. Electrolysis, decomposition voltage, overpotential. Faraday laws. Practical galvanic cells, Leclanché cell, lead-acid cell. Corrosion, oxide layers, local galvanic cells, corrosion protection.

12th week:
Lecture: Measurement of temporal concentration changes. Reaction rate, rate equation, order, kinetic differential equations. Determination of the rate equation, integral and differential methods, half-life. Elementary reactions, molecularity, mechanism. Bodenstein (steady state) principle. Chain reactions, homogeneous and heterogeneous catalysis, enzyme reactions, Michaelis--Menten kinetics. Autocatalysis, oscillation.
Seminar: Measurement of temporal concentration changes. Reaction rate, rate equation, order, kinetic differential equations. Determination of the rate equation, integral and differential methods, half-life. Elementary reactions, molecularity, mechanism. Bodenstein (steady state) principle. Chain reactions, homogeneous and heterogeneous catalysis, enzyme reactions, Michaelis--Menten kinetics. Autocatalysis, oscillation.

13th week:
Lecture: Basic notions of photochemical and radiochemical reactions. Temperature dependence of the reaction rate, Arrhenius equation, collision theory, the principle of the activated complex theory. Reactions in liquid phase, cage effect, diffusion and energy controlled reactions.
Seminar: Basic notions of photochemical and radiochemical reactions. Temperature dependence of the reaction rate, Arrhenius equation, collision theory, the principle of the activated complex theory. Reactions in liquid phase, cage effect, diffusion and energy controlled reactions.

14th week:
Lecture: Structure of matter and chemical bonding. Elements of quantum mechanical description, particle-wave duality, uncertainty principle. Stationary Schrödinger equation, particle-in-a-box, atomic orbitals, MO and VB methods, molecular orbitals of di- and polyatomic molecules, HOMO, LUMO, bonds, hybridization
Seminar: Structure of matter and chemical bonding. Elements of quantum mechanical description, particle-wave duality, uncertainty principle. Stationary Schrödinger equation, particle-in-a-box, atomic orbitals, MO and VB methods, molecular orbitals of di- and polyatomic molecules, HOMO, LUMO, bonds, hybridization

15th week:
Lecture: Structural methods. Rotational, vibrational and electronic spectra, determination of bond length and force constants, normal modes, spectra as „fingertips". Raman spectra. Electron spectroscopy. Principle of X-ray, electron and neutron diffraction.
Seminar: Structural methods. Rotational, vibrational and electronic spectra, determination of bond length and force constants, normal modes, spectra as „fingertips". Raman spectra. Electron spectroscopy. Principle of X-ray, electron and neutron diffraction.

Requirements

The seminars are compulsory. The lectures are 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.

CHAPTER 16
ACADEMIC PROGRAM FOR THE 2ND YEAR

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: 1. lecke Magázás

4th week:
Practical: 2. lecke A boltban

5th week:
Practical: 3. lecke Élelmiszerek

6th week:
Practical: 4. lecke Az étteremben

7th week:
Practical: Revision. Mid-term test

8th week:
Practical: 5. lecke A városban

9th week:
Practical: 6. lecke Merre kell menni?

10th week:
Practical: 7. lecke Felszólítás

11th week:
Practical: 7. lecke Felszólítás

12th week:
Practical: 8. lecke Tanácsok

13th week:
Practical: Practice

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

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

Requirements

Attendance

Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

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

Consultation classes: In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.
Course book: Győrffy, E., Ph.D.: Hogy s mint? 2/1.
Website: Audio files to the course book, oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Department of Physiology

Subject: **HUMAN PHYSIOLOGY I.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **30**
Seminar: **15**

1st week:
Lecture: Introduction Passive and active transport, Resting membrane potential

2nd week:
Lecture: Ion channels The mechanism of action potential Basic receptor functions

3rd week:
Lecture: Cardiac action potential ECG, Excitation-contraction coupling in cardiac muscle

4th week:
Lecture: Contractile properties of the heart, The cardiac output and the cardiac cycle, Effects of humoral agents and the autonomic nervous system on the heart

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, General properties of circulation

8th week:
Lecture: Arterial circulation

9th week:
Lecture: Microcirculation, venous circulation, Cardiovascular reflexes, Humoral control of cardiovascular function

10th week:
Lecture: Nervous control of cardiovascular function, Cerebral- and coronary circulation, Splanchnic, cutaneous and muscular circulation

11th week:
Lecture: Pulmonary circulation. Shock, 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 oft lectures and seminars is compulsory. The signature of the Lecture Book may be refused for the semester if one has more than four absences from the seminars. Each student must attend seminars by joining to that particular group which is specified by the Admission Office. For continuous updates on all education-related maters, please check

the departmental web-site (http://phys.dote.hu).
The lectures of Human Physiology I. are listed at the web site of the Department of Physiology (http://phys.dote.hu).
2. Evaluation during the semester
The knowledge of students will be tested 2 times per 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 presentation. The mark of the written test is calculated according to the following table:

score mark
0 – 59 %: fail
60 – 69 % pass
70 – 79 % satisfactory
80 – 89 % good
90 – 100 % excellent

- However, if one's average score of the two mid-semester tests is above 60%, and (s)he has fewer than 6 lecture absences, it is not compulsory to take the ESE, and a mark based on the average score will be offered (see the table above).
- If someone is not satisfied with this result, (s)he may participate the ESE during the examination period. In this case only the result of the ESE will be considered.

Division of Colloid- and Environmental Chemistry

Subject: **COLLOID AND SURFACE CHEMISTRY PRACTICE**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **28**

8th week:
Practical: 1. Rheological characterization of concentrated emulsions (creams).

9th week:
Practical: 2. Measurement of surface tension of solutions by Du Nouy tensiometer.

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

11th week:
Practical: 4. Adsorption from solution.

12th week:
Practical: 5. Solubilization.

13th week:
Practical: 6. Determination of size distribution of a sedimenting suspension.

14th week:
Practical: 7. Experiments on thixotropic or other anomalous fluids with a rotation vis-cometer

15th week:
Practical: Supplementary practice, consultation, correction.

Division of Colloid- and Environmental Chemistry

Subject: **COLLOID AND SURFACE CHEMISTRY THEORY**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **28**

1st week:
Lecture: "A": A subject of colloid and surface chemistry. Classification of the dispersed systems. Type of colloids. Typical everyday colloids. Preparation of colloids. The basic characteristics of colloid systems: dispersity, morphology, spatial distribution, interparticle interactions, normal distribution. Thermodynamic and kinetic stability. "B": Molecular interactions. Attraction forces: ion-ion,

ion-dipole, dipole-dipole, dispersion interactions. Hydrogen bonds, hydrophobic interactions.

2nd week:
Lecture: "A": Definition of energy of activation. Basic transport properties. Description of Brownianmotion, random walk. Diffusion coefficient, average distance. Einstein-Stokes equation. Sedimentation equation. Diffusion flux and diffusion equation. Measuring of size distribution with different techniques (osmosis, diffusion, light scattering, Donnanpotential).
"B": Interfacial chemistry. Definition of interfacial region, types of interfaces. Surface tension. Surface tension depends on the intermolecular interactions. Determination of surface tension. Temperature dependence of surface tension. Spreading. Monomolecular films.

3rd week:
Lecture: "A": Curved interfaces. The effect of surface curvature on the vapor pressure of a liquid. Kelvin equation. Meniscus, contact angle, wetting, spreading. Hydrophilic, hydrophobic surfaces.
"B": Adsorption. Hardy-Harkins best continuity rule. Surface activity and inactivity. Gibbs isotherm equation. Monolayer and multilayers (Langmuir-Blodgett). Physical state of the monolayers. Application of monolayers. Film formation. Analysis, membrane modeling, water conservations, sensors. Vesicles, liposomes.

4th week:
Lecture: "A": Solid surfaces. Molecular structure and characterization. Adsorption at the gas-solid interface, adsorption isotherms. Type of isotherms. Langmuir, BET. Freundlich. Capillary condensation. Adsorption from solutions. Applications. Theory and types of chromatographies. Retention time.
"B": Association colloids. Amphipatic molecules. Surfactants, physical properties of solutions of surfactants. Micelles. CMC, dependence on chain length and salt concentration. The Krafftpoint. Detergency, chemistry of washing. Solubilization. Applications in medicine. Lung surfactants.

5th week:
Lecture: "A": Charged surfaces. Origin of surface charge, electrodes. Mulliken experiment, elementary charge. Electrical double layer models. Hemholtz, GouyChapman and Stern models. Zeta-potential. Reverse the sign of the zeta potential.
"B": Electrical double layer. Zeta-potential. Electrophoresis.

6th week:
Lecture: "A": Stability of dispersion colloids. Electrostatic theory: DLVO. Inter-particle forces. Hamakerequation. Hardy-Schulze rule. Stability ratio. Critical coagulation concentration. Applications of DLVO theory, Steric and electrostatic stabilization. Bridging flocculation. Depletion flocculation lyophilic colloids as sensitizer.
"B": Macromolecules. Definitions and types. Structures and sizes of polymers. Determination of size. Sorption of polymers. Bridging flocculation. Depletion flocculation lyophilic colloids as sensitizer. Targeted medicine.

7th week:
Lecture: "A": Emulsion. Emulsion types. Identification of emulsion type. Emulsion stability. Emulsifiers HLB (hydrophilic -lipophilic balance) values. Physical properties of emulsions. Breaking emulsions. Foam. Foam Stability. Inhibition and breaking of foam. Examples.
"B": Rheology. Theory and definition of viscosity. Rheological types of mat-ter. Share rate, basic equations. Viscosity- and rheometers. Viscosity of solutions of colloids. Response of matter for sharing typical cases. Structure of coherent systems. Gels, creams:thixotropy.

Division of Inorganic and Analytical Chemistry

Subject: **BASIC BIOCHEMISTRY**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **40**
Practical: **5**

1st week:
Lecture: Introduction to Biochemistry. Molecular design of life. Amino acids. Peptides. Primary, secondary, tertiary, quaternary structures.
Practical: Kinetic studies on beta-glucosidase from sweet almond.

2nd week:
Lecture: Determination of peptide structures. Peptide synthesis. Denaturation. Methods for separation and structural determination. Protein structure and function. Oxigen transporting proteins: Myoglobin and Hemoglobin.

3rd week:
Lecture: Carbohydrates. Biological role of carbohydrates. Monosaccharides, disaccharides, polysaccharides. Glycoconjugates. Glycobiology.

4th week:
Lecture: Introduction to biological membranes. Lipids. Classification and functions of lipids. Neutral fats, oils and waxes. The major classes of membrane lipids. Membrane

models.

5th week:
Lecture: Enzymes. Classification. Coenzymes. Mechanism of enzyme action. Control of enzyme activity.

6th week:
Lecture: The kinetic properties of enzymes. The Michaelis-Menten model. Graphic evaluation of the kinetic parameters. Inhibition of enzyme activity. Diagnostic importance of enzymes.

7th week:
Lecture: Metabolism: basic concepts and design. Metabolism of carbohydrates. Glycolysis. The fate of pyruvate. Entry of fructose and galactose into glycolysis. Gluconeogenesis. Cori cycle.

8th week:
Lecture: The pentose phosphate pathway. Glycogen metabolism. Glycogen degradation and synthesis. The coordinated control of synthesis and breakdown. Disease of glycogen storage.

9th week:
Lecture: Citric acid cycle. Pyruvate dehydrogenase complex. The citric acid cycle is a source of biosynthetic precursors. Control of the citric acid cycle. The glyoxylate cycle.

10th week:
Lecture: Oxidative phosphorylation. The three enzyme complexes of the respiratory chain. Synthesis of ATP. The ATP yield of the complete oxidation of glucose.

11th week:
Lecture: Fatty acid metabolism. Oxidation of fatty acids and unsaturated fatty acids. Energetics of fatty acid oxidation. Synthesis of ketone bodies.

12th week:
Lecture: Biosynthesis of fatty acids. The elongation cycle. Biosynthesis of cholesterol. Clinical aspects. Obesity.

13th week:
Lecture: Digestion of proteins. Amino acid degradation. Transamination and oxidative deamination. The urea cycle. The link between the urea and the citric acid cycle. The fates of the carbon skeletons of amino acids. Disorders of amino acid metabolism.

14th week:
Lecture: DNA and RNA: Molecules of heredity. Purine and pyrimidine bases, nucleosides and nucleotides. cAMP, ATP. Nucleotid coenzymes.

15th week:
Lecture: Digestion of nucleic acids Catabolism of purines and pirimidines. Disorders in the metabolism. One-carbon groups carried by tetrahydrofolate. Biological methylations.

Requirements

Detailed instructions will be given on the first lecture.

Division of Inorganic and Analytical Chemistry

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

1st week:
Lecture: Introduction: Analytical chemistry and its objectives. The analytical process.
Seminar: Calculations in acid-base systems: Simple problems about pH calculations (revision). Quantitative description of solutions containing monobasic acids and bases. Buffers in acid-base chemistry.

2nd week:
Lecture: Equilibria in solution and their quantitative analytical applications. Acid-base equilibria (based on Brönsted-Lowry theory). Basic concepts: bases, acids, ampholytes, self-dissociation, base strength, acid strength, dissociation constant, association constant, pH calculations: pH of strong acids and strong bases, weak acids, weak bases and buffers, pH of polyprotic acids and bases, overlapping parallel acid-base equilibria: macro- and micro constants. Acidimetric and alkalimetric titrations: titration curves and their calculations, factors influencing the shape of the titration curves, end-point, equivalence point, methods of endpoint indication (Gran function and its applications). Applications of acid-base titrations.
Seminar: Calculations in acid-base systems: Simple problems about pH calculations (revision). Quantitative description of solutions containing monobasic acids and bases. Buffers in acid-base chemistry.

3rd week:
Lecture: Complex formation equilibria. Basic concepts: stepwise equilibrium, equilibrium constants, concentration distribution curves, simultaneous equilibria influencing complexometric reactions, conditional stability constant, chelate effect. Complexometric titrations: titration curves and their calculations, factors influencing the shape of the titration curves, indication in complexometry, selective complex formation reactions. Applications of complexometric titrations.
Seminar: Di- and polybasic acids and bases, ampholytes (illustration with evaluating the titration curve of a sample of phosphoric acid). Problems based on acid-base titrations. Calculation of equivalence points, indicator selection. Calculations for planning titration-based methods, calculation of final results from experimental data.

4th 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: Di- and polybasic acids and bases, ampholytes (illustration with evaluating the titration curve of a sample of phosphoric acid). Problems based on acid-base titrations. Calculation of equivalence points, indicator selection. Calculations for planning titration-based methods, calculation of final results from experimental data.

5th week:
Lecture: 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: Di- and polybasic acids and bases, ampholytes (illustration with evaluating the titration curve of a sample of phosphoric acid). Problems based on acid-base titrations. Calculation of equivalence points, indicator selection. Calculations for planning titration-based methods, calculation of final results from experimental data.

6th week:
Lecture: Methods of analytical separation: Basic concepts: distribution constant, distribution coefficient, separation factor. Separation methods with phase transition (analyses based on mass, gas evolution and extraction).
Seminar: Practice, consultation.

7th 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). Gas chromatography: components of a gas chromatograph, detectors, role of temperature in gas chromatography, practical applications. Liquid chromatography: modules of a liquid chromatograph, detectors, liquid chromatographic methods (GLC, LLC) and their applications, ion chromatography, gel chromatography, planar chromatographic methods. Electrophoresis: classical and capillary electrophoresis. Selection of the most efficient separation method.
Seminar: Test I.

8th 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). Gas chromatography: components of a gas chromatograph, detectors, role of temperature in gas chromatography, practical applications. Liquid chromatography: modules of a liquid chromatograph, detectors, liquid chromatographic methods (GLC, LLC) and their applications, ion chromatography, gel chromatography, planar chromatographic methods. Electrophoresis: classical and capillary electrophoresis. Selection of the most efficient separation method.
Seminar: Complex formation equilibria. The concept and calculation of conditional stability constants. Calculations connected to complexometric titration methods.

9th week:
Lecture: Introduction to instrumental analytical techniques. Basic concepts: signal, noise, sensitivity, limit of detection, reproducibility, accuracy, precision, calibration, signal to noise ratio, basics of error calculation.
Seminar: Complex formation equilibria. The concept and calculation of conditional stability constants. Calculations connected to complexometric titration methods.

10th week:
Lecture: Fundamentals of electrochemistry. Analytical applications of the interaction between electric current and matter. Potentiometry.
Seminar: Quantitative description of redox equilibria. Calculations based on redox titration methods.

11th week:
Lecture: Other electroanalytical techniques: Voltammetric and polarographic methods. Conductometry. Coulometry and electrogravimetry.

Seminar: Quantitative description of redox equilibria. Calculations based on redox titration methods.

12th week:
Lecture: Spectroscopic methods: Origin of spectrum. Classification of methods. Atomic spectroscopic methods: atomic absorption spectrometry, inductively coupled plasma-ICP. Molecular spectroscopy, UV-VIS. Analytical applications of fluorescence and phosphorescence. IR and Raman spectroscopy.
Seminar: Quantitative description of precipitation equilibria. Solubility product and solubility. Effects of pH and the excess of precipitating ion on solubility. Problems based on precipitation reactions and precipitation-based titrimetric methods.

13th week:
Lecture: Other spectroscopic methods: ESCA, NMR, ESR. Mass spectrometry. Basic principles: ionization, detectors, data evaluation, FT-MS. Coupled mass spectrometric techniques: GC-MS, LC-MS, ICP-MS, MS-MS.
Seminar: Quantitative description of precipitation equilibria. Solubility product and solubility. Effects of pH and the excess of precipitating ion on solubility. Problems based on precipitation reactions and precipitation-based titrimetric methods.

14th week:
Lecture: Thermal analysis: Analytical applications of the interaction between heat and matter. Thermogravimetry, derivative thermogravimetry. Differential thermal analysis, DSC. Thermometric titrations.
Seminar: Practice, consultation.

15th week:
Lecture: Methods of sample preparation. Quality assurance and quality control.
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 preexam 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.

Division of Organic Chemistry

Subject: **ORGANIC CHEMISTRY PRACTICE II.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Receiving of laboratory equipments. Safety educations. Repetition: crystallization from methanol and water, filtration, TLC, determination of melting point.

2nd week:
Practical: Isolation of Carvone from caraway. Steam distillation. Separation of benzoic acid and benzanilide by liquid-liquid extraction.

3rd week:
Practical: Identification of hydroxyl derivatives of hydrocarbons. Test tubes reaction. Identification of unknown compounds.

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

5th week:
Practical: Preparation of benztriazol. Preparation of 3-nitroaniline.

6th week:
Practical: Identification of amino derivatives of hydrocarbons. Identification of unknown compounds.

7th week:
Practical: Identification of oxo derivatives of hydrocarbons. Identification of unknown compounds. Preparation of cyclohexanone-2,4-dinitrophenylhidrazone.

8th week:
Practical: Preparation of Benzoic acid and N-benzoyl-glycine.

9th week:
Practical: Preparation of 2,3-diphenyl-quinoxaline and 2,6-dibenzylidene-cyclohexanone.

10th week:
Practical: Isolation and saponification of the glyceride of nutmeg.

11th week:
Practical: Test tube reactions of carbohydrates.

Identification of amino acids.

12th week:
Practical: Test tube reaction of amino acids and proteins.

13th week:
Practical: Complex test: Identification of unknown compounds.

14th week:
Practical: Preparation of O-Acetyl-salicylic acid, complex chromatography.

15th week:
Practical: Deposite 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.

Division of Organic Chemistry

Subject: **ORGANIC CHEMISTRY THEORY II.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: Classifications and bond structure of alcohols, phenols and ethers. Preparation of alcohols, ethers and their thio analogues.

2nd week:
Lecture: Reactions of alcohols, ethers and their thio analogues.

3rd week:
Lecture: Preparations and reactions of phenols and their thio analogues.

4th week:
Lecture: Characterization, reactions and preparations of amines.

5th week:
Lecture: Preparations and reactions of nitro, diazo derivatives and diazonium salts.

6th week:
Lecture: Reactions and preparations of alde-hydes, ketones and dioxo derivatives. Nucleophilic addition-elimination reactions.

7th week:
Lecture: Classification, description and reactivity of mono- and dicarboxylic acids and their derivatives.

8th week:
Lecture: Nucleophilic substitution on acyl carbon, preparation and transformation of carboxylic acid and its derivatives.

9th week:
Lecture: Characterization, reactions and preparations of amino acid. Strucuture of peptides and proteins.

10th week:
Lecture: Structure elucidation of proteins, peptide synthesis. Characterization and structures of carbohydrates, mono-, di- and polisaccharides.

11th week:
Lecture: Reactions of carbohydrates, synthesis of di- and polisaccharides.

12th week:
Lecture: Heterocyclic compounds, heteroaromatic systems. Three-, four- and five-membered heterocycles with one heteroatom. ÃŸ-lactam antibiotics.

13th week:
Lecture: Compounds with porphyrin skeleton. Five-and six-membered ring systems with two or more heteroatoms.

14th week:
Lecture: Characterization and importance of heterocyclic natural products.Alkaloids. Flavonoids and vitamins.

15th week:
Lecture: Nucleosides, structures, preparations and transformations of nucleotides and nucleic acids.

Requirements

Terminal examination, comprehensive examination.

Division of Pharmacognosy

Subject: **BOTANY PRACTICE**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Structure of plant cells, Diagnostic plant cell constituents, Inclusions, Vacuoles, Staining plant cells (Neutral Red, Lugol Solution etc.), Plasmolysis of plant cells, Preparation of your own microscopic samples.

2nd week:
Practical: Epidermis studies, Stomata, Primary and secondary epidermis, Digitalis purpureae folium, Salviae folium, Absinthi folium, Altheae folium, Thymi folium, Types of ti-chomes in Lamiaceae. Frangulae cortex, Analysis of Periderms and lenticels. Studying of Parenchymas and Collenchymas, Salep tuber, Calami Rhysoma, Marrubi herba, Capsici fructus, Cydonae fructus, Foeniculi fructus, Auranti pericarpium.

3rd week:
Practical: Studies on vascular tissues, Xylem - Tracheas, Tracheides, Xylemparenchymas, Fiber cells, Types of thickening, Phloem - Sieve cells, Sieve tubes, Sieve plates, Companion cells, Albuminous cells, Types of Vascular Bundles, Veratri radix, Agrimo-niae herba, Calami rhizoma, Belladonae folium, Filicis maris rhyzoma.

4th week:
Practical: Tissues of Primary and Secondary Roots, Veratri radix, Valerianae radix, Primulae radix, Liquiritiae radix, Saponariae albae readix, Belladonae radix, Gentianae radix, Altheae radix.

5th week:
Practical: Tissues of Secondary roots, Ipecacuanhae radix, Ononidis radix, Ratanhiae radix, Tissues of rhizomes, Graminis rhizoma,Veratri rhizoma, Rhei rhizoma.

6th week:
Practical: Tissues of Stems (Monocotyledonopsida, Dicotyledonopsida), Characterization of Cortex, Agrimoniae herba, Stem of Equisetum arvense, Chinae cortex, Frangula cortex, Cinnamoni cassiae Cinnamon ceylonici cortex, Quercus cortex.

7th week:
Practical: Tissues of leaves, Sennae folium, Absinthi folium, Uvae ursi folium, Belladonae folium, Stramonii folium, Hyoscyami folium, Calciumoxalate inclusions.

8th week:
Practical: Fruit studies, Foeniculi fructus, Carvi fructus, Anisi vulgaris fryctus, ConiAuranti pericarpium,i fructus, Coriandri fructus, Juniperus galbulus, Fruits of Apiaceae.

9th week:
Practical: Seed studies, Tisseus of seeds, Lini semen, Strophanti semen, Sinapis nigrae semen, Strychni semen, Myrysticae semen, Stereomicroscopic studies on seeds, Identifying characters of drugs.

10th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Dicotyledonopsida, Ranunculaceae, Helleboraceae, Papaveraceae, Fumariaceae.

11th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Rosaceae, Fabaceae, Apiaceae, Brassicaceae.

12th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Apocyneceae, Rubiaceae, Boraginaceae,

13th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Lamiaceae, Solanaceae, Scrophulariaceae, Asteraceae.

14th week:
Practical: Characterization of Pharmaceutically important Families and Species of plants, Plant Identification, Monocotyledonopsida, Liliaceae, Poaceae.

15th week:
Practical: Oral and written test.

Requirements

Detailed information is given in the first practical course.

Division of Pharmacognosy

Subject: **BOTANY THEORY**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: History of pharmaceutical botany and pharmaceutical plant science. Anatomy, structure, function and metabolism of plant cells. Basic plant cell types, function of plant organelles.

2nd week:
Lecture: Anatomy of plant tissues, Meristems, Parenchymas, Collenchymas, Sclerenchymas, Epidermis (types of stomata), Vascular tissues, Ground tissues, Secretory tissues.

3rd week:
Lecture: Primary and Secondary plant body, Tissues of the Root and Stem, Xylem and Phloem, Function of Vascular Cambium. Organs Organizations of Root and Stem systems.

4th week:
Lecture: Primary and Secondary plant body, Tissues of Leaves and Reproductive Organs (anatomy of flowers), Organization of Leaves and Reproductive Organs, Plant Life Cycle, Gametophyte and Sporophyte, Sexual Reproduction of Plants, Double Fertilization and Pollination of Plants.

5th week:
Lecture: Inflorescens. Fruit Types (true and accessory fruits) and Seed Dispersal. Plant Embryo and Seed Anatomy, Development of Seeds, Types of Seedlings.

6th week:
Lecture: Classification and Systematic of Plants, Historical Aspects of Plant Classification, Artificial- versus Natural System of Classification, Levels of Taxonomic Categories, Phenetic, Numeric- and Applied Taxonomy.

7th week:
Lecture: Kingdoms of Living Creatures, Cyanobacteria, Algae and Origin of Eukaryotes, Endosymbiont Theory, Embryophyta, Cormophyta and Spermatophyta Plants, (Mosses, Liverworts and Hornworts, Lychenophyta, Pteridophyta, Gymnospermatophyta, Angiospermatophyta).

8th week:
Lecture: Characterization of Gymnospermatophyta Plants and Pharmaceutically Important Taxa and Species Characterization of Angiospermatophyta Plants and Pharmaceutically Important Taxa and Species of the Taxon, Dicotyledonopsida, Orders and Families of Magnoliidae and Pharmaceutically Important Species of the Taxa.

10th week:
Lecture: Monocotyledonopsida, Orders and Families of Liliidae and Pharmaceutically Important Species.

11th week:
Lecture: Monocotyledonopsida, Orders and Families of Commelidinae and Pharmaceutically Important Species of the Taxa.

12th week:
Lecture: Dicotyledonopsida, Orders and Families of Hamamelididae and Pharmaceutically Important Species of the Taxa.

13th week:
Lecture: Dicotyledonopsida, Orders and Families of Dilleniidae and Pharmaceutically Important Species of the Taxa.

14th week:
Lecture: Dicotyledonopsida, Orders and Families of Rosoidae and Pharmaceutically Important Species of the Taxa.

15th week:
Lecture: Dicotyledonopsida, Orders and Families of Asteridae and Pharmaceutically Important Species of the Taxa.

Requirements

Detailed information is given in the first lecture.

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

Subject: **PHYSICAL CHEMISTRY II.**
Year, Semester: 2nd year/1st semester
Number of teaching hours:
Practical: **45**

1st week:
Practical: Introduction, general information and safety training (1 hr).

2nd week:
Practical: One of the following topics: Measuring densities by pycnometer, composition of a binary mixture. Measuring electrical conductivity of solutions.

3rd week:
Practical: One of the following topics: Measuring the concentration of a coloured solute by spectrophotometry. Determination of NaHCO3 content of a solid sample by gas volumetry.

4th week:
Practical: One of the following topics: pH-metric titration curves of hydrochloric and acetic acids. Study of electrolysis.

5th week:
Practical: One of the following topics: Mutarotation of glucose measured by polarimetry. Measuring electromotive force of a galvanic cell.

6th week:
Practical: One of the following topics: Reaction rate of decomposition of H2O2 measured by gas volumetry.Investigation of buffers.

7th week:
Practical: One of the following topics: Distillation of an alcohol-water mixture. Determination of heat of combustion by using a bomb calorimeter.

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 equilibrium. Dissociation constant of weak acids measured by conductometry.

11th week:
Practical: One of the following topics: Dissociation equilibria of ampholites, determination of isoelectric pH.Acid catalysed hydrolyis of saccharose.

12th week:
Practical: One of the following topics: Kinetics of a second order reaction: hydrolysis of esters. Initial rates and activation energy of the iodine clock.

Requirements

The measurements and knowledge of the associated theory are marked 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 (which will be provided on the 1st week).
Lab practies 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 Biochemistry and Molecular Biology

Subject: **PHARMACEUTICAL BIOCHEMISTRY**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **40**
Practical: **5**

1st week:
Lecture: Biochemistry of nutrition. Energy requirement. Basic metabolic rate. Energy content of the food. Energy storage and thermogenesis. Biochemical mechanism of obesity. Protein as N and energy source. N balance. Essential amino acids. Protein malnutrition. Vegetarianism. Clinical aspects of protein nutrition. Carbohydrates and lipids. Vitamins. Structure, biochemical functions. Relationship between the biochemical functions and the symptoms of deficiency. Essential inorganic elements of the food (metabolism, function, deficiency).

2nd week:
Lecture: Medical importance of the lipid metabolism. Organization of lipid structures. Mixed micelles in the digestive tract. Lipoproteins in blood plasma. Synthesis of cholesterol Cholesterol transport in the body. The LDL receptor and its gene. Excretion of cholesterol. Biochemical explanation of elevated blood cholesterol levels. Biochemical explanation of obesity.

3rd week:
Lecture: Genomics. Levels of eucariotic gene expression. The active chromatin. Regulation of transcription. Regulation at the mRNA level. Translational regulation. Posttransational events. Gene therapy.

4th week:
Lecture: Biochemistry of cell proliferation. Mitotic cascade. M-phase kinase. Products and biochemical function of protooncogenes. Mechanism of oncogene formation. Tumor suppressor genes and their biochemical function. Biochemical features of terminal differentiation. Biochemistry of programmed cell death.

5th week:
Lecture: Signal transduction I. Term and levels of regulation. Term and levels of regulation. Significance and interrelationship between metabolic, cytokine, hormonal and neuronal regulation. Forms of external signals. Receptors and transducers. Systems increasing the sensitivity of regulation: allosteria, substrate cycle, interconversion cycle, cascades.

6th week:
Lecture: Signal transduction II. Signalling pathways of nonpenetrating signals. Ionchannel receptors. Seven transmembrane domain receptors G proteins and GTP-ases. The adenylate cyclase and the phospholipase C signalling pathway.G proteins and GTP-ases. The adenylate cyclase and the phospholipase C signalling pathway. Control of enzyme activity.The NO system. Nuclear receptors.

7th week:
Lecture: Steroid hormones. Vitamin D. Stress. Stress proteins and enzymes in eukariotic cells. Heat shock proteins and their functions under normal circumstances. Hsp 70 and hsp 60 protein families. Role of chaperones and chaperonins. Thermotolerance of the cell. Hsp 90 protein family and their role in the cells. Transcriptional regulation of heat shock genes. Stress signals.

8th week:
Self Control Test

9th week:
Lecture: Hemoglobin. Biochemistry of the liver I. Hemoglobin; structure, function and regulation. Pathological forms of hemoglobin. Comparison of hemoglobin and mioglobin, regulation of oxygen binding. Biochemistry of the liver.

10th week:
Lecture: Biochemistry of the liver II. Biotransformation. Biochemical consequences of ethanol consumption.

11th week:
Lecture: Biochemistry of blood clotting I. Cellular, humoral and vascular aspects of blood clotting. Structure, activation, adhesion and aggregation of thrombocytes. Classification of blood clotting factors and their role. Factors depending on vitamin K.

12th week:
Lecture: Biochemistry of blood clotting II., Iron metabolism. Contact phase of blood coagulation. Blood clotting in the test tube and in the body. Classification of blood coagulation. Role of thrombocytes and the vascular endothel. Limiting factors, inhibitors and activators of blood coagulation. Fibrinolysis. Iron transport, storage and distribution in the human body. Molecular regulation of the iron level in cells: stability of transferrin receptor and ferritin mRNA, IRE binding protein. Risk of the free iron and intracellular hemolysis.

13th week:
Lecture: Hem. Extracellular matrix. Uroporphynoids, hem-proteins. Synthesis of hem, regulation of the synthesis in eukariotic cells. Degradation of hem: formation, conjugation and excretion of bile pigments. Hem oxygenase. Disorders in hem metabolism. Biochemistry of the extracellular matrix: function and components. Glucosaminoglycans and proteoglycans. Collagens:

structure, function and genetic origin.

14th week:
Lecture: Biochemistry of the sport. Biochemistry of the cytoskeleton. Proteins of myofibrils. Molecular mechanism for the generation of force. Metabolic fuel of muscle. Metabolism of muscle in various work load. Effect of exercise.practice: Biotransformation.
Practical: Enzymes of biotransformation.

Requirements

Students have to participate on the obligatory**lectures** (see in the schedule) and carry out the practice. Only one absence is accepted in case of the obligatory lectures. The subject will not be signed if somebody misses more than one obligatory lecture!

There is one**practice**in this semester, it is obligatory for every student. Those students, who carry out the practice perfectly, will get 2 bonus points. The bonus points can be added either to the result of the control tests or to the result of the written part of the final exam.

There will be two written **control tests** during the semester, each for 20 points. Control tests consist of single- and multiple choice test questions from the material of the lectures. Students getting at least 50 % of the maximum points will be exempted from the written part of the final exam. Control tests are not obligatory.

The **final exam** consists of a written and an oral part. The written exam includes single- and multiple choice test questions from the material of Pharmaceutical Biochemistry. Oral exam can be taken only if the student collects at least 50 % in the written part before. If the written part is accepted, but the oral exam is unsuccessful, then the written part will not be repeated on the „B" or „C" exam. In the case of unsuccessful written part of the „C" exam, students will get oral questions too (but first students have to take the written test!).
Students will have 2 questions on Pharmaceutical Biochemistry at the oral exam.

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: student2014).

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: A lakás.

4th week:
Practical: Elromlott.

5th week:
Practical: Szolgáltatások

6th week:
Practical: A klinika 1.

7th week:
Practical: A klinika 2.

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

9th week:
Practical: Panaszok, gyógyszerek 1.

10th week:
Practical: Panaszok, gyógyszerek 2.

11th week:
Practical: Szokások.

12th week:
Practical: Utasítások.

13th week:
Practical: Revision.

14th week:
Practical: Practice.Mid-term test.

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

Requirements

Attendance

Language class attendance is compulsory. The maximum percentage of allowable absences is 10 % which is a total of 2 out of the 15 weekly classes. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

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

Consultation classes: In each language course once a week students may attend a consultation class with one of the teachers of that subject in which they can ask their questions and ask for further explanations of the material covered in that week. These classes are optional.
Course book: See the website of the department.
Website: Audio files to the course book, oral exam topics and vocabulary minimum lists are available from the website of the Department of Foreign Languages: ilekt.med.unideb.hu.

Department of Pharmaceutical Technology

Subject: **2ND YEAR SUMMER PRACTICE FOR PHARMACY STUDENTS**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **120**

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY I. PRACTICE**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction, general information. Labour safety, laboratory regulations. Requirements. Weighing. Weighing of chamomile, and talcum. To learn: Latin declension, numbers.

2nd week:
Practical: Technical books of pharmacy (European Pharmacopoeia, Formulae Normales, Hungarian Pharmacopoeia) The prescription, nomenclature. Simple calculations (w/w%). Solutions, knowledge of auxiliary materials. Weighing of Paraffinum liquidum, and distilled water. 1. Solutio acida pro parvulo FoNo VII 100,0g.

3rd week:
Practical: Dose calculations. Reading prescriptions. Preparation simple and composite solutions. 2. Solutio pepsini FoNo VI 50,0g 3. Solutio contra rhagades mamillae FoNo VII 34,0g.

4th week:
Practical: Enemas and solutions internal and external use. 4. Solutio papaverini 50,0g (magistral priscription) 5. Klysma chlorali pro infante FoNo VI 80,0g 6. Solutio theophyllini FoNo VII 100,0g 7. Solutio acriflavini FoNo VI 20,0g.

5th week:
Practical: Nasal and ear drops. Mixture. 8. Mixtura pectoralis FoNo VII 100,0g 9. Otogutta sulfadimidini FoNo VI 10,0g 10. Nasogutta zinci c. ephedrino FoNo VII 10,0g.

6th week:
Practical: Test I.

7th week:
Practical: Gargle and suspensions. 11. Gargarisma chloroformii FoNo VI 125,0g 12. Solutio Castellani sine fuchsino FoNo VII. 13. Suspensio terpini FoNo VII. 100,0g.

8th week:
Practical: Preparation of drops and their dose calculation. 14. Gutta aethylmorphini FoNo VI 10,0g 15. Gutta codeini FoNo VI 10,0g 16. Gutta methylhomatropini composita FoNo VI 10,0g 17. Suspensio anaesthetica FoNo VI 100,0g.

9th week:
Practical: Preparation of decoctions and infusions. 18. Decoctum saponariae FoNo VI 100,0g 19. Infusum ipecacuanhae pro parvulo FoNo VI 100,0g 20. Solutio noraminophenazoni pro parvulo FoNo VII 100,0g.

10th week:
Practical: Preparation of emulsions. 21. Emulsio olei jecoris FoNo VII 100,0g 22. Solutio antisudorica FoNo VII 50,0g 23. Glycerinum boraxatum FoNo VII 20,0g.

11th week:
Practical: Individual drug preparation practice.

12th week:
Practical: Preparation of special emulsions (linimentum). 24. Suspensio siccans FoNo VI 100,0g 25. Linimentum ammoniatum FoNo VI 100,0g 26. Linimentum scabicidum FoNo VI 100,0g.

13th week:
Practical: Test II.

14th week:
Practical: Solutions for veterinary use. 27. Spiritus iodosalicylatus AUV 30,0g 28. Emulsio paraffini cum phenolphtaleino FoNo VII. 29. Suspensio zinci aquosa FoNo VII 100,0g 30. Diluendum menthae.

15th week:
Practical: Supplemental practice. Consultation. Correction.

Requirements

Study regulations: You have to attend every practical in Pharmaceutical Technology. If you can't go to practice, you have to bring us certification by a physician. But on 1-2 occasions if you have very important activity, please foretell it us, and we will discuss when we have any possibility to replace you them. These occasions will be valid with exception the tests. You have to get ready for practical. We will give you guidelines of practical. You have to study it, and next practical we will discuss it. After then you have to write test in that guidelines. This test will contain 5 measure conversions and 5 Latin words or phrases.

At the end of the semester you will get 5 stages practical grade. With a fail grade in a practical course the student doesn't have the right to sit for the examinations. Before the term of examination, you will have right to correct your fail

grade. You will have to go to the head of the department Prof. Dr. Vecsernyés, and you will have to report your knowledge of pharmaceutical technology practical. You will have 2 possibilities to write summary tests in pharmaceutical technology practical. The average of that 2 grades will be passed, you will have the right to sit for the exams. The final grade in pharmaceutical technology practical will be the average of 2 summary tests and the grade of your answers in practical. We will, measure back your preparation after your practical. Not every preparation, just 2-3. The average of measuring back will be min. passed. If it won't be , you have to prepare them once more. You have to write protocol about the practical according to our discussion. Please bring with you a note book. You have to write the practical number, and the date, and if you will prepare medicines, you have to write them on a prescription forms. You should make notes in that book. If the average of 4 practical grades of 4 semesters (because you will have to attend pharmaceutical technology lectures and practical for 4 semesters) will be 4,50 you wouldn't set practical exam. If your average of 4 grades will be between 4,00-4,49 you wouldn't choose practical theme in final exam.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY I. THEORY**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Pharmaceutical Technology and the task of Pharmaceutical technology. Definition of drug and dosing. Prescription.

2nd week:
Lecture: The connection between bio-pharmacy and pharmaceutical technology. Basic principles of pharmacokinetics. The connection between pharmaceutical preparation and drug effect.

3rd week:
Lecture: Technological processes : Heating. Distillation. Other methods for separation (sedimentation, centrifugation, expression, drying, filtration).

4th week:
Lecture: Filtration. Theoretical bases of filtration. Types of instruments for filtration.

5th week:
Lecture: Drying. Theoretical bases of drying. Methods of drying. Heating transfer at room temperature. Fluidization. Lyophilization.

6th week:
Lecture: Sterilization. Theoretical bases of sterilization. Methods of sterilization. Methods of physical sterilization. (heat sterilization, sterilization with radiation, sterilization with ultrasound.)

7th week:
Lecture: Aseptic formulation of drug. "Clear surface" . Microbiological purity of dosage forms. Principles for aseptic formulation. Disinfections. Preservation.

8th week:
Lecture: Stability of drugs. Principles of reaction kinetics and the use of reaction kinetics in pharmaceutical technology. Rapid stability investigations.

9th week:
Lecture: Storage of drugs and drug preparations. Factors that influence storage. Packing materials.

10th week:
Lecture: Mixing. Quality of mixing. Duration of mixing. Instruments for mixing. Homogenity.

11th week:
Lecture: Solutions. Thermodynamic terms of solution, dissolution, diffusion, time of dissolution. Possibilities of increasing dissolution. Colligative properties.

12th week:
Lecture: Reology I. Physical and chemical theoretical bases of drug formulation. Monophasic-systems. Mechanical properties of liquids, viscosity, bases of reology. Determination of viscosity.

13th week:
Lecture: Reology II. Di-and polyphasic systems. Interfacial occurrence: interface, interfacial tension. Wetting angle. Dispers polyphasic systems, viscosity of dispers polyphasic systems, sedimentation and flocculation, electrostatic occurrence, coagulation.

14th week:
Lecture: Total Quality Management (TQM)

15th week:
Lecture: The guidelines of Good Manufacturing Practice (GMP)

Department of Physiology

Subject: **HUMAN PHYSIOLOGY II.**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **30**
Seminar: **10**
Practical: **20**

1st week:
Lecture: Introduction, preparation for laboratory practice, Neural and hormonal control of the GI tract, Motor functions of the gastrointestinal tract

2nd week:
Lecture: Secretion of saliva and gastric juice, Exocrine functions of the pancreas and liver, Absorption of nutrients

3rd week:
Lecture: Food intake and its regulation, Vitamins, Test I.

4th week:
Lecture: Energy balance, regulation of body temperature, Introduction, quantitative description of renal function, Mechanism and regulation of glomerular filtration

5th week:
Lecture: Tubular transport processes, Urinary concentration and dilution, clinical correlates

6th week:
Lecture: Osmoregulation, water balance, diuretics, Defense of body fluid volume, sodium balance, Acid-base balance and acid-base disturbances

7th week:
Lecture: Calcium balance, physiology of bone, Potassium balance, mycturition, Test II.

8th week:
Lecture: General principles of endocrinology, Hypophysis, growth hormone

9th week:
Lecture: Male, Female gonadal functions, Pregnancy, lactation

10th week:
Lecture: The thyroid gland I., The thyroid gland II.

11th week:
Lecture: The hormones of adrenal cortex I., The hormones of adrenal cortex II., The hormones of adrenal medulla, catecholamines

12th week:
Lecture: The hormones of pancreatic islets I., The hormones of pancreatic islets II., Endocrine regulation of intermedier metabolism

13th week:
Lecture: Test III.

Requirements

1. Signature of Lecture Book Attendance of lectures, laboratory practices and seminars is compulsory. The signature of the Lecture Book may be refused for the semester in case of more than four absences from the seminars and/or more than two absences from the practices. All missed practices must be made up, whereas the completion of a missed seminar with a different group is not possible. Completion of all topic sheets in the Exercise Book, each verified by the signature of the teacher, is also a precondition of the signature of the Lecture Book. Student must attend seminars with the group specified by the Admission Office. For continuous updates on all education-related issues please consult with the departmental web-site (http://phys.dote.hu). The lectures of Human Physiology II are listed at the web site of the Department of Physiology (http://phys.dote.hu) 2. Evaluation during the semester (mid-semester tests) The knowledge of students will be tested 3 times per 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 during 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 "Not Accepted", then the student will be given laboratory practical questions in the written part of the final exam. 3. Examination The second semester is closed by the final exam covering the topics of all lectures, seminars and laboratory practices of the full academic year. A and B chances are written tests (multiple choice questions), while C chance is an oral exam. The score for the “A exam” is calculated as follows: score for the “A exam”= (x+y)/2 where x= average % of the five mid-semester written tests (two in the 1st term and three in the 2nd term) y= the result of the written test completed on the exam Then, the mark is calculated according to the following table:

score	mark
0 – 59.9 %:	fail
60 – 69.9 %	pass
70 – 79.9 %	satisfactory
80 – 89.9 %	good
90 – 100.9 %	excellent

- If the score of the written test is less than 60% (y<60%), the result of the exam is fail regardless the average score of mid semester tests (x). - The mark 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 both the mid-semester tests will be replaced by the minimum possible score converted from the mark earned on the exam (see the table above). - If the final evaluation of the Closing lab is "Not Accepted", then the student will be given laboratory practical questions in the written part of the final exam.

Division of Inorganic and Analytical Chemistry

Subject: **QUANTITATIVE ANALYTICAL CHEMISTRY II. PRACTICE**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **75**

1st week:
Practical: Introduction to the Quantitave Analytical Chemistry Laboratory. Laboratory Safety Information. Preparation of 0.1 mol/dm 3HCl titrant (250cm)Review of lab equipment.

2nd week:
Practical: Determination of the exact concentration of the HCl titrant soluiton using KHCO 3 stock solution.Determination of HgO in a HgO-KCl mixture (unknown sample).Preparation of 0.1 mol/dm 3 NaOH titrant by the Sörensen (500 cm) and determination of its exact concentration.Determination of oalic acid (unknown sample).Erlenmeyer flask preparation for non-aqueous titration.

3rd week:
Practical: Simultaneous determination of sulfuric acid and boric acid in a mixture (unknown sample).Determination of an alkaloid (papaverine) in non/aqueos solution by titration (unknown sample).Preaparation of filters for the gravimetric determination Ca(II) as Ca(COO) 2 precipitate.Preparation of 0.02 mol/dm 3 KMnO 4 titrant (250cm3).

4th week:
Practical: Preparation of 0.05 mol/dm 3 Na 2(COO) 2 stock solution (100.00 cm 3).Determination of the exact concentration of the KMnO 4 titrant solution using Na 2 (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/dm 3Na 2 S 2 O 3 titrant (250 cm 3) and determination of its exact concentration using 0.003 mol/dm 3 KIO 3 stock soluiton. 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/dm 3 KBrO 3 titrant (250.00 cm 3).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/dm 3 AgNO 3 stock solution (unknown sample).

7th week:
Practical: Preparation of 0.01mol/dm 3 Na 2 EDTA titrant solution (250.00 cm 3).Simultaneous determination of Ca 2+ and Mg 2+ 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 istrumental 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.
Attendence 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).

Division of Inorganic and Analytical Chemistry

Subject: **QUANTITATIVE ANALYTICAL CHEMISTRY II. THEORY**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **15**

Requirements

Exam: oral

Division of Pharmacognosy

Subject: **PHARMACOGNOSY I. PRACTICE**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction. General discussion.

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

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

4th week:
Practical: Fixed oils.

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

6th week:
Practical: Essential oils I.: Monoterpene-based essential oils.

7th week:
Practical: Essential oils II.: Sesquiterpene and phenylpropanoid-based essential oils.

8th week:
Practical: Drugs containing secoiridoids and sesquiterpene lactones.

9th week:
Practical: Iridoids.

10th week:
Practical: Triterpenes, triterpene saponins.

11th week:
Practical: Cardenolid glycosides.

12th week:
Practical: Basic techniques in medicinal plant biotechnology.

13th week:
Practical: Elicitation in medicinal plant tissue cultures.

14th week:
Practical: Oral and written test.

15th week:
Practical: ORAL AND WRITTEN TEST

Requirements

Detailed information is given in the first practical course.

Division of Pharmacognosy

Subject: **PHARMACOGNOSY I. THEORY**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: The origins of pharmacognosy. The nomenclature of plant drugs; Sources of drugs, Production of drugs; Basic metabolic pathways, Origin of primary and secondary metabolites. The biosynthetic pathways.

2nd week:
Lecture: Carbohydrates, fats, proteins.

3rd week:
Lecture: Terpenoids, alkaloids, phenolic compounds, Purifed honey, Fig, Manna, Tamarind pulp, Starch, Tragacanth gum, Acacia gum, Sterculia gum, Agar, Irish moss, Linseed, Psyllium, Quince seeds, Marshmallow root, Cotton Fatty acids, Fats, Arachis oil, Olive oil, Sesame oil, Castor oil, Linseed oil, Coconut oil, Cottonseed oil, Maize oil, Theobroma oil, Hydnocarpus oil, Beeswax, Spermaceti, Prostaglandins.

4th week:
Lecture: Proteins, Enzymes.

5th week:
Lecture: Terpenoid compounds, monoterpenes, volatile oils.

6th week:
Lecture: Peppermint, Spearmint, Lavender, Rosemary, Oil of rose.

7th week:
Lecture: Terpenoid compounds, monoterpenes, volatile oils.

8th week:
Lecture: Peppermint, Spearmint, Lavender, Rosemary, Oil of rose.

9th week:
Lecture: Caraway, Dill, Coriander, Thyme, Eucalyptus leaves.

10th week:
Lecture: Cardamomi fruit, Bitter orange peel, Lemon peel, Juniper berris Aniseed, Star anise fruit, Fennel, Cinnamom, Camphor.

11th week:
Lecture: Clove, Nutmeg, Calmus, Ginger, Turmeric.

12th week:
Lecture: Iridoids, Valerian root, Gentian

13th week:
Lecture: Sesquiterpenes, Chamomile flowers, Matricaria flowers, Absinth Fish berries, Santonica flowers, Diterpenoids, Colophony resin, Turpentine Triterpenes, Saponins, Liquorice root, Quillaia bark.

14th week:
Lecture: Senega root, Ginseng; Plant steroids, Steroidal saponins.

15th week:
Lecture: Dioscorea tubers, Sisal, Sarsaparilla root, Solanum sp., Soya bean, Cardiac-glycosides, Digitalis leaf, Digitalis lanata leaf, Oleander, Strophanthus seeds, Convallaria, Adonis, Erysimum, Indian squill, Black hellebore rhizome.

Requirements

Detailed information is given in the first lecture.

CHAPTER 17
ACADEMIC PROGRAM FOR THE 3RD YEAR

Department of Anatomy, Histology and Embryology

Subject: **PHARMACEUTICAL NEUROBIOLOGY**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **39**
Seminar: **16**
Practical: **10**

1st week:
Lecture: 1 Introduction. Development of the nervous system. Parts of the nervous system.2 The histology of the nervous system.3 Dura mater, pia mater. Circulation in the brain. Blood-brain barrier.
Practical: Histology: The neural tissue. Histology of the spinal cord.1. Peripheral nerve (HE)2. Spinal ganglion (HE)3. Spinal cord (HE)4. Spinal cord (Bielschowsky impregnation)

2nd week:
Lecture: 1 The structure of the spinal cord.2 The structure of the brainstem and cerebellum.3 The structure of the diencephalon and telencephalon
Practical: Histology of the cerebral and cerebellar cortex.1 Cerebellum (HE) 2 Cerebellum (Golgi impregnation)3 Cerebrum (Golgi impregnation)

3rd week:
Lecture: 1 Biochemistry of the neurones: metabolic pathways in the brain.2 Morphological basis of the neurotransmission. The chemical synapses.3 Axonal transport. Degeneration and regeneration in the nervous system.
Practical: Anatomy: Gross anatomy of the spinal cord and the brain

4th week:
Lecture: 1 Neurotransmitters, biochemistry of the receptors.2 Presynaptic mechanisms of neurotransmission.3 Postsynaptic mechanisms of neurotransmission.
Seminar: Biochemistry

5th week:
Lecture: 1 Membrane properties of the neurones and glial cells.2 Features and significance of the central excitatory and inhibitory synapses.3 Somatomotor function of the spinal cord.
Practical: Physiology

6th week:
Lecture: 1 The somatomotor system.2 Vestibular apparatus.3 Roles of spinal chord in the coordination of movements.
Practical: Physiology

7th week:
Lecture: Roles of brain stem and cerebellum in the coordination of movements.
Practical: Physiology
Self Control Test (SELF CONTROL - THE DATE DEFINED LATER)

8th week:
Lecture: 1 General principles of the somatosensory system. The skin.2 The somatosensory system.3 Somatovisceral sensory functions.
Practical: Physiology

9th week:
Lecture: 1 Neural mechanisms of the pain perception.2 Theoretical background of the pain therapies.3 Anatomy of the eye.
Practical: Histology: Functional microscopic anatomy of the skin1 Fingertip skin (HE)2 Scalp (HE)

10th week:
Lecture: 1 Biochemistry of vision.2 Physiology of vision.3 Physiology of taste and smell sensation.
Practical: Physiology

11th week:
Lecture: 1 Anatomy of auditory and vestibular system.2 Physiology of hearing.3 The structure of the autonomic nervous system.
Practical: Histology: Microscopic anatomy of the eyeball and internal ear.1 Eye (HE) 2. Inner ear (HE)

12th week:
Lecture: 1 Functional properties of the autonomic nervous system.2 Central vegetative regulation (hypothalamus).3 The functional properties of the cerebral cortex (EEG).
Practical: Physiology

13th week:
Lecture: 1 Sleep, wakefulness.2 Learning, memory.3 The monoaminergic and limbic system.
Practical: Physiology

14th week:
Lecture: 1 Motivation, behaviour, emotions.2 Information storage in the CNS, memory disorders..
Seminar: Biochemistry

Self Control Test (SELF CONTROL - THE DATE DEFINED LATER)

Requirements

The neurobiology course is an integrated one, delivered as a joint effort of three departments (Departments of Anatomy, Histology and Embryology; Biochemistry and Physiology). In this academic year the Physiology Department is the course organizer. The educational activities of the Neurobiology course include lectures, seminars and practices. Most of the regulations concerning these activities are specific to the individual departments and will be introduced by the respective education officers.

In the detailed program of the course (which, in fact, corresponds to the list of requirements) as well as here, both the compulsory and suggested textbooks are listed. Note, however, that the requirements of the course include material delivered in the lecture hall only, not necessarily available in the recommended textbooks, while in other cases some information in the suggested textbook is not regarded as part of the exam material.

Attendance of the seminars and practices is compulsory, although one may have two seminar and practice absences. If one collects three or more seminar and practice absences (regardless of the reason of the absences) the course organizer may refuse the verification of the lecture book. Making up the missed seminars and practices may be possible, but the individual departments determine the actual procedure.

During the term two self-control tests (SCTs) are organized. Attendance of the SCTs is compulsory. If one meets the passing conditions (see below), the end-semester examination may be substituted with the result achieved on the basis of these tests (i.e. the student in question will be exempted of the final exam). The maximum achievable score is 100 points in the following distribution:

Anatomy: 40 points
Biochemistry: 17.5 points
Physiology: 42.5 points

The points collected in the frame of the two tests will be summarized on a departmental basis. If someone collects at least 60 % of the total number of points provided by the individual departments, she/he will be exempted of the end-semester examination (ESE). The 60 % limit is the following on departmental basis:

Anatomy: 24 points
Biochemistry: 10.5 points
Physiology: 25.5 points

If someone reaches the 60% limit of all departmental scores, the ESE result can be calculated in the following way:
Total number of points score

0 - 59 points: fail
60 - 69 points: pass
70 - 79 points: satisfactory
80 - 89 points: good
90 - 100 points: excellent

If the departmental score achieved by the student is more than 60%, and he/she wishes to improve this score, it can be done on any of the exam days.

Department of Foreign Languages

Subject: **MEDICAL HUNGARIAN I.**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Bevezetés, ismétlés

2nd week:
Practical: Testrészek és belső szervek

3rd week:
Practical: Gyógyszertípusok

4th week:
Practical: Gyógyszerszedés

5th week:
Practical: Leggyakoribb betegségek

6th week:
Practical: Mellékhatások

7th week:
Practical: Gyakorlás

8th week:
Practical: Mid term test

9th week:
Practical: Eszközök a gyógyszertárban

10th week:
Practical: Az elsősegély doboz tartalma

11th week:
Practical: Az úticsomag tartalma

12th week:
Practical: Gyógyszerellátással kapcsolatos igék

13th week:
Practical: Ismétlés

14th week:
Practical: End term test

15th week:
Practical: Evaluation

Requirements

3rd year Medical Hungarian 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. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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.

Students may not take Medical Hungarian course before entering the 3rd year.

Students in the 4th, 5th, year have to pay an additional tuition fee of 500 USD per semester for taking mandatory Hungarian language courses. These students are organized into a separate group from the 3rd year students.

Testing, evaluation

In Medical Hungarian course, students have to sit for a mid-term and an end-term written language tests and 2 short minimum requirement oral exams.

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.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

If the final score is below 60, the student once can take an oral remedial exam covering the 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:
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. Pathochemistry and laboratory signs of cell damage 4. Pathobiochemistry of inflammation

3rd week:
Lecture: 5. Clinical biochemistry of tumor metastasis6. Pathobiochemical alterations in association with tumor growth and metastasis formation and their laboratory detection I.

4th week:
Lecture: 7. Pathobiochemical alterations in association with tumor growth and metastasis formation and their laboratory detection II.8. Tumormarkers in the diagnosis of malignant diseases

5th week:
Lecture: 9. Inherited metabolic diseases and their laboratory diagnostics I.10. Inherited metabolic diseases and their laboratory diagnostics II.

6th week:
Lecture: 11. Inherited metabolic diseases and their laboratory diagnostics III.12. Pathobiochemistry of plasma proteins

7th week:
Lecture: 13. Disorders of iron metabolism. Laboratory diagnostics of microcytic anemias.14. Laboratory diagnostics of hemoglobinopathies

8th week:
Lecture: 15. Laboratory diagnostics of macrocytic and hemolytic anemias16. Laboratory diagnostics of quantitative platelet disorders.

9th week:
Lecture: 17. Laboratory diagnostics of acut and chronic leukemias and lymphomas I.18. Laboratory diagnostics of avut and chronic leukemias and lymphomas II.
Practical: Notes on Laboratory Safety. Molecular genetic methods in clinical biochemistry.
Self Control Test

10th week:
Lecture: 19. Laboratory diagnostics of acut and chronic leukemias and lymphomas III.20. History of blood transfusion, blood group serology
Practical: Hematology I. Blood sampling, anticoagulation. Preparation of blood smears, staining.

11th week:
Lecture: 21. Biochemistry, inheritance and antigens of ABO blood group system and its clinical significance 22. Biochemistry, inheritance and antigens of Rh 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. Other blood group system (Kell, Kidd, Duffy, MN, Ss, Ii) 24. Laboratory diagnostics of central nervous system diseases. Laboratory investigation of the cerebrospinal fluid.
Practical: Hematology III. Determination of hemoglobin and hematocrit. Hematology analyzers.

13th week:
Lecture: 25. Clinical biochemistry and laboratory diagnostics of porphyrias26. Clinical biochemistry at the extremes of ages
Practical: Hematology IV. Investigation of peripheral blood smears in hematological malignancies. Myeloma multiplex.

14th week:
Lecture: 27. Therapeutic drug monitoring I.28. Therapeutic drug monitoring II.
Practical: Transfusiology. ABO and Rh blood group determination.

15th week:
Lecture: 29. Pharmacogenetics30. Disorders of vitamine metabolism
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 I. PRACTICE**
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 pracice 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").

Department of Pharmaceutical Chemistry

Subject: **PHARMACEUTICAL CHEMISTRY I. THEORY**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **45**

1st week:
Lecture: Topics and history of pharmaceutical chemistry. Pharmacopeia, as the standard of quality control. Physical and chemical investigations. Methods for the identification and control of medicinal substances. Nomenclature of the medicinal substances.
Practical: Short introductory practice.

2nd week:
Lecture: Pharmacologically important inorganic compounds.
Practical: Analytical exercises of selected inorganic compounds according to Pharmacopeia.

3rd week:
Lecture: General anesthetics: inhalation anesthetics, barbital and non-barbital-type narcotics. Anesthetics with pregnane skeletone. Sedatives and hypnotics: alcohols, aldehydes, urethanes, barbiturates and with 4-quinazolone, bezodiazepine and piperidine skeletone.
Practical: Alcohols, solvents. Barbituric acid derivatives.

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

5th week:
Lecture: Narcotic Analgetics: codeine, morphine, thebaine derivatives Morphinane, bezomorphane, phenylpiperidine and metadone derivatives. Non-diphenylmethane -type amines. Another major analgetics. Competitive antagonists of morphine and morphine derivatives.
Practical: Selected aromatic compounds: resorcinol, thymol, acetylsalicylic acid etc.

6th week:
Lecture: Analgetic antipyretics: derivatives of salicylic acid, aniline, and anthranylic acid. Pyrazolone- and arylacetic acid-type analgetics.
Practical: Phenothiazin derivatives; methenamine.

7th week:
Lecture: Analgetic antipyretics: steroid anti-inflammatory agents. Antihistamines.
Practical: Carbohydrates, ascorbic acid, citric acid.

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

9th week:
Lecture: Antipsychotics, neuroleptics (major tranquilizers): Reserpine. Derivatives of phenothiazine and butyrophenone. Diphenylbutyl piperidines.

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

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

12th week:
Lecture: Central and peripheral antitussive agents. Expectorants. Bronchodilators. Medicines effective on the nasal and other mucosa, and on the respiratory system.

13th week:
Lecture: Central Muscle relaxants: ethers of glycerol and derivatives of 1,3-propanediol. Peripheral muscle relaxants: substances with membrane-stabilizing and

depolarizing effects.

14th week:
Lecture: Parasymphatomimetics: acetylcholin and the direct parasymphatomimetics. Nitrogen-containing, and organophosphoric ester-type cholinesterase inhibitors (paralysers). Insecticids. Cholinesterase-reactivating antidote.

15th week:
Lecture: Parasymphatolytics: alkaloids with tropane skeletone. Synthetic tropane derivatives. Another parasymphatolytics without tropane skeletone.

Requirements

Lectures: Attendance to lectures is emphatically recommended. All material covered in lectures is an integral part of the subject and therefore included in the self-control tests and the final exam. Several new concepts and ideas are discussed in the lectures only and are not present in the textbook. Examination is possible only after a succesfully finished laboratory practice.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY II. PRACTICE**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **120**

1st week:
Practical: Course: Prescription, Pharmacy Introduction, general information. Labour safety, laboratory regulations. Requirements. Solution, emulsion, suspension. 1.Emulsio olei ricini FoNo VII. 2. Suspensio nystatini FoNo VII. 3. Solutio nephrolytica FoNo VII. Course: Sterile and aseptic formulations. Requirements for aseptic preparations. Requirements for infusions: Not always obligatory requirements. Always obligatory requirements. Preparation of infusions solutions. Quality control of infusion solutions. Electrolyte-containing infusion solutions: Infusio natrii chlorati (Ph.Hg.VII.), Infusio salina (Ph.Hg.VII.).

2nd week:
Practical: Course: Prescription, Pharmacy European Pharmacopoeia. Suppositories, liniments. 4. Linimentum ad pernionem FoNo VII. 5. Calibration of suppository moulds individually (1,2,3g) with Adeps solidus 50, Adeps solidus compositus, Massa macrogoli. Course: Sterile and aseptic formulations, Calculations for the concentration of infusion solutions. Pyrogens. Sugar-containing infusion solutions: Infusio glucosi (Ph.Hg.VII.) Infusio manniti (Ph.Hg.VII.).

3rd week:
Practical: Course: Prescription, Pharmacy 6. Determination of replacement factors 2w/w% aminophenazon in Adeps solidus 50 suppository base 5w/w% acetaminophenum in Adeps solidus compositus suppository base. 7. Suppositorium aminophenazoni 0,10g FoNo VI. Course: Sterile and aseptic formulations. Sterilization. Supplementary infusion solutions. Infusion solutions against acidosis: Infusio natrii hydrogencarbonici 1,3% (Ph.Hg.VII.) Infusion solutions against alkalosis: Infusio gastrica.

4th week:
Practical: Course: Prescription, Pharmacy Preparation of ointments. 8. Unguentum antiseptica FoNo VII. (typical suspension ointment) 9. Unguentum carbamidi FoNo VII. (dissolved ointment) 10. Unguentum boraxatum cum aqua calcis FoNo VII. (w/o ointment) 11. Suppositorium antispastica pro parvulo FoNo VI. Course: Sterile and aseptic formulations. Preparation of eye drops: Oculogutta neomycini FoNo VII. 10,0g Oculogutta zinci FoNo VII. 10,0g.

5th week:
Practical: Course: Prescription, Pharmacy Preparation of pilulas. 12. Cremor aquosus FoNo VII. (o/w ointment) 13. Unguentum nasale FoNo VII. 14. Pilula coffeini FoNo VI. 15. Suppositorium laxans FoNo VII. Course: Sterile and aseptic formulations. Test.

6th week:
Practical: Course: Prescription, Pharmacy Test 1. Course: Formulation of tablets and granules. Tablets in general. Tableting mechanism. Types of tablet machines. Single punch and rotary tablet machines. Assembling and operation of a tablet machine. Preparation: Tabletta acidi acetylsalicylici.

7th week:
Practical: Course: Prescription Pharmacy 16. Unguentum salicylatum FoNo VII. in different percentage. 17. Suppositorium analgeticum forte FoNo VII. 18. Unguentum contra dolorem FoNo VII. 19. Solutio metronidazoli FoNo VII. Course: Formulation of tablets and granules. Granulates and granulation. Quality control of granulates. Granulation with binding agents I. Preparation: Granulatum magnesii trisilicici.

8th week:
Practical: Course: Prescription Pharmacy 20. Suppositorium spasmolyticum FoNo VII. 21. Unguentum contra rhagades mamillae FoNo VII. 22. Solutio contra rhagades mamillae FoNo VII. 23. Unguentum contra oxyurim FoNo VII. Course: Formulation of tablets and granules. Granulation with binding agents II. Preparation: Tabletta codeinii chlorati.

9th week:
Practical: Course: Prescription Pharmacy 24. Unguentum refrigerans FoNo VII. 25. Suppositorium ad nodum FoNo VII. 26. Unguentum hemorrhoidale FoNo VII. 27. Unguentum nutritivum FoNo VII. Course: Formulation of tablets and granules. Quality control of tablets. Preparation: Tabletta papaverinii chlorati.

10th week:
Practical: Course: Prescription, Pharmacy Undivided powders. 28. Pulvis antacidus FoNo VII. 29. Pulvis Caroli FoNo VII. 30. Unguentum camphoratum ad pernionem FoNo VII. Course: Formulation of tablets and granules. Test.

11th week:
Practical: Course: Prescription Pharmacy. Individual drug preparation practice. Course: Galenic preparations and their manufacture. Preparation and investigation of solutions.

12th week:
Practical: Course: Prescription Pharmacy 32. Sirupus zinci FoNo VII. 33. Suppositorium antiemeticum FoNo VII. 34. Unguentum contra rheumam FoNo VII. 35. Sal ad rehydrationem in different compositions FoNo VII. Course: Galenic preparations and their manufacture. Preparation and investigation of syrups.

13th week:
Practical: Course: Prescription Pharmacy Test 2. Course: Galenic preparations and their manufacture. Preparation and investigation of suspensions.

14th week:
Practical: Course: Prescription Pharmacy 36. Calibration of vaginal moulds with Massa macrogoli 37. Determination of replacement factors of nystatin. (3w/w% nystatin in Massa macrogoli) Course: Galenic preparations and their manufacture. Preparation and investigation of emulsions.

15th week:
Practical: Course: Prescription, Pharmacy Supplemental practice. Consultation. Correction. Course: Galenic preparations and their manufacture. Test.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY II. THEORY**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Pharmaceutical dosage forms: liquid pharmaceutical forms, solutions, stock solutions, aqueous solutions, oily solutions, syrups, aromatic waters, gargles, alcoholic solutions.

2nd week:
Lecture: Colloid systems. Molecular colloids, association colloids (termotrop and liotrop association colloids). Mucilages, enemas.

3rd week:
Lecture: Ophthalmic pharmaceutical forms, definitions. Anatomy of the eye, biopharmacy problems. Requirements for ophthalmic pharmaceutical forms. (compatibility, without irritation, free from bacteria, stability). Basic principles for pharmaceutical formulation. Special ophthalmic pharmaceutical forms, contact lamella, contact lens. Tanks. Ear drops, nasal drops.

4th week:
Lecture: Emulsions. Macro and micro-emulsions. Emulsifying agent. Stability of emulsions. Stabilization of emulsions. Formulation of emulsions, investigations.

5th week:
Lecture: Suspensions. Definitions, types of suspensions, physical and chemical basics of suspensions. Stability of suspensions. Formulation of suspensions, investigations.

6th week:
Lecture: Injections. Basic principles. Definitions. Methods of administration. Biopharmaceutical problems. Basic requirements for the formulation of injections. Active agents and ingredients of injectable systems. Solvents. Formulation of injections.

7th week:
Lecture: Tanks for injections, filling and closing. Sterilization. Examination of injections and quality assurance. Stabilization of injections. Special injectable solutions. (injectable suspensions, dry powder, tablets)

8th week:
Lecture: Infusion systems. Basic principles. Formulation of infusions. Investigation of infusions. Special infusion systems. Tanks (use of plastic tanks.). Parenteral nutritive infusions, fat emulsions. All in one mixtures.

9th week:
Lecture: Blood and blood preparations. Blood preservative solutions. Solutions for volume substitution. Formulation of serum and vaccine. Exemption of HIV.

10th week:
Lecture: Inhalations and aerosols. Definitions. Biopharmaceutical problems. Formulation of inhalations and aerosols in theory and also in practice. Propellants. Dosage forms that protect environment. Containers for aerosols. Filling of aerosols. Investigation of aerosols.

11th week:
Lecture: Ointments. Definitions, nomenclature. Colloidal theory of ointment bases. Classification of ointment bases.

12th week:
Lecture: Formulation of ointment, cream, paste and hydrogel. Requirements for choosing the suitable ointment base. Biopharmacy of ointments. Quality assurance of ointments. Ophthalmic ointments, paste.

13th week:
Lecture: Pharmaceutical dosage forms for rectal use. Definitions. Suppository bases and suppository ingredients. Formulation of suppository by cold compression and moulding. Special formulations for suppositories, investigation of suppositories. Suppository mold.

14th week:
Lecture: Vaginal pharmaceutical forms (vaginal suppositories, vaginal balls,-cylinders,-tablets).Other vaginal pharmaceutical forms. Biopharmaceutical problems. Pills. Formulation of pills. Control of pills. Bolus.

15th week:
Lecture: Consultation.

Requirements

2nd semester of Pharmaceutical technology consisting of 15 weeks in the first semester in the year 3.

Division of Pharmacognosy

Subject: **PHARMACOGNOSY II. PRACTICE**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction. General discussion.

2nd week:
Practical: Alkaloids I.

3rd week:
Practical: Alkaloids II.

4th week:
Practical: Alkaloids III.

5th week:
Practical: Anthraquinone containing plant drugs.

6th week:
Practical: Flavonolignane and dianthrone containing plant drugs.

7th week:
Practical: Flavonoid containing plant drugs I.

8th week:
Practical: Flavonoid containing plant drugs II.

9th week:
Practical: Tannin containing plant drugs.

10th week:
Practical: Coumarin containing plant drugs.

11th week:
Practical: Plant drugs containings miscellaneous phenolic compounds.

12th week:
Practical: Examination of herbal tea mixtures.

13th week:
Practical: Examination of herbal tea mixtures. Identification of plant drugs. Consultation.

14th week:
Practical: Oral and written test.

15th week:
Practical: Oral and written test.

Requirements

Detailed information is given in the first practical course.

Division of Pharmacognosy

Subject: **PHARMACOGNOSY II. THEORY**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Alkaloids, history, distribution, properties.

2nd week:
Lecture: Ornithine-derived alkaloids, Hyoscyamus leaf, Egyptian Hen-bane Stramonium leaf, Belladonna herb and root, Duboisia leaves, Coca leaf and Cocaine.

3rd week:
Lecture: Lysine-derived alkaloids, Lobelia, Tobacco alkaloids.

4th week:
Lecture: Phenylalanine-derived alkaloids, Ephedra, Khat.

5th week:
Lecture: Opium poppy, Opium, Hydrastis, Ipecacuanha, Colchicum seed and Corm.

6th week:
Lecture: Triptophan-derived alkaloids, Ergot, Calabar bean, Nux vomica, Rauwolfia, Catharanthus roseus, Cinchona.

7th week:
Lecture: Imidazole alkaloids, Jaborandi leaf and pilocarpine.

8th week:
Lecture: Purine alkaloids, Coffee seed, Thea, Cocoa seed, Maté leaf, Cola, Guarana.

9th week:
Lecture: Phenols and phenolic glycosides; Phloroglucinol-derivatives, Male fern.

10th week:
Lecture: Anthraquinones and glycosides, Senna leaf, Cascara bark, Frangula bark, Rhubarb, Aloes.

11th week:
Lecture: Flavonoid compounds, Silybum, Sambucus.

12th week:
Lecture: Tannins, Galls and Tannic acid, Hamamelis, Catechu, Rhatany Coumarins and their glycosides, Visnaga.

13th week:
Lecture: Lignans, Podophyllum and Podophyllum resin.

14th week:
Lecture: Simple phenolic compounds, Vanilla and Vanillin, Baerberry leaves, Cinnamom, Capsicum, Henna, Indian hemp.

Requirements

Detailed information is given in the first lecture.

Department of Foreign Languages

Subject: **MEDICAL HUNGARIAN II.**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **30**

1st week:
Practical: Bevezetés, ismétlés

2nd week:
Practical: High frequency verbs used in pharmacy

3rd week:
Practical: Az emésztőrendszer és a hozzá kapcsolódó gyógyszerek

4th week:
Practical: Hashajtók

5th week:
Practical: Légzőrendszerrel kapcsolatos gyógyszerek

6th week:
Practical: Köptetők

7th week:
Practical: Gyakorlás

8th week:
Practical: Mid term test

9th week:
Practical: Bőr és bőrre való készítmények

10th week:
Practical: Szem és szemre való készítmények

11th week:
Practical: Gyógynövények

12th week:
Practical: Párbeszéd a gyógyszertárban I.

13th week:
Practical: Mini presentations

14th week:
Practical: Ismétlés

15th week:
Practical: Oral exam. Evaluation

Requirements

3rd year Medical Hungarian 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. The missed classes may only be made up in the same week. Maximally, two language classes may be made up with another group and students have to ask for written permission (via e-mail) 24 hours in advance from the teacher whose class they would like to attend for a makeup because of the limited seats available. 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.

Students may not take Medical Hungarian course before entering the 3rd year.

Students in the 4th, 5th year have to pay an additional tuition fee of 500 USD per semester for taking mandatory Hungarian language courses. These students are organized into a separate group from the 3rd year students.

Testing, evaluation

In Medical Hungarian course, students have to sit for a mid-term and an end-term written language tests and 2 short minimum requirement oral exams.

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.

The minimum requirement for the mid-term and the end-term tests is 50 % each. If a student does not score this much he/she has to repeat the test. Based on the final score the grades are given according to the following table:

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

If the final score is below 60, the student once can take an oral remedial exam covering the 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:

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: 1. Organization and function of the immune system.2. Central and peripheral lymphoid organs.
Seminar: Cells involved in immune mechanisms.

2nd week:
Lecture: 3. Characteristics of innate and acquired immunity.4. Functions of the complement system.
Seminar: Molecules involved in immune mechanisms.

3rd week:
Lecture: 5. Antigen recognition by B-cells.6. Characteristics of antibodies.
Seminar: Characteristics of antigens.

4th week:
Lecture: 7. Molecular basis of variability of antibodies.8. Effector functions of antibodies.
Practical: Development of antibodies (production and isolation of polyclonal antibodies, vaccination).

5th week:
Lecture: 9. Antigen recognition by T-lymphocytes.10. Role of the professional antigen presenting cells.
Practical: Production, characterization and utilization of monoclonal antibodies.

6th week:
Lecture: 11. Structure and function of the MHC molecules.12. Antigen processing and presentation.
Practical: Methods based on secondary interaction following antigen-antibody binding I. (precipitation, agglutination).

7th week:
Lecture: 13. Cytokines, lymphokines, chemokines.14. Effector functions of T-lymphocytes.
Practical: Methods based on secondary interaction of antigen-antibody binding II. (activation of the complement system).

8th week:
Lecture: 15. Role of helper T-lymphocytes in the polarization of the immune responses.16. Various forms of cytotoxicity.
Practical: Methods based on primary interaction of antigen with antibody (various types of ELISA, immunosorbent assay, immunoblot, immunohistochemistry).

9th week:
Lecture: 17. Development of T-lymphocytes in the thymus.18. Generation of central tolerance.
Practical: Functional study of immune competent cells I, (effector functions of macrophages, cytotoxic reactions, mast cell degranulation).

10th week:
Lecture: 19. Immune responses to extracellular pathogens.20. Immune responses to intracellular pathogens.
Practical: Functional study of immune competent cells II (polyclonal B- and T-lymphocyte activation, measurement of cell proliferation and functions, ELISA, ELISPOT, FACS ICC).
Self Control Test

11th week:
Lecture: 21. Mechanisms of peripheral immunological tolerance and physiological autoimmunity.22. Autoimmune diseases.
Practical: Immune-modulating agents, organ and tissue transplantation.

12th week:
Lecture: 23. Immune deficiencies.24. Tumor immunology, tumor antigens and immune responses against tumors.

13th week:
Lecture: 25. Allergy.26. The immunological aspects of bone marrow transplantation.

14th week:
Self Control Test

Requirements

Participation in 30% of the lectures is obligatory. The obligatory lectures will be marked during week 1. Participation in the Seminars and the Practical Courses is obligatory.
The Department shall refuse to sign the students' Lecture book if they are absent from more than two practices or seminars in a semester. The 1st oral exam exemption test is held during week 10 and includes the topics of Basic Immunology and Seminars (1-3 weeks). The date of the 2nd oral exam exemption test is on week 14 and includes the topics of Immune Pathology (part of Complex Pathology) and of Practical Courses. 0 score of any of the oral exam exemption tests due to absence or to low performance would not be accepted and the final grade would not be offered. A final grade will be offered based on the average results of the two oral exam exemption tests which are accepted over 51%. If the average of scores of the two oral exam exemption tests does not reach 51% of the total score an exam will have to be taken during the exam period. This exam consists of a written entry test and an oral exam. If a student has an average result over 51%, but she/he does not accept the offered grade, she/he can take an oral exam during the exam period. In the oral exam the final grade can be better or worse than the offered grade.

Department of Laboratory Medicine

Subject: **CLINICAL BIOCHEMISTRY II.**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **60**
Seminar: **8**
Practical: **30**

1st week:
Lecture: 1. Coagulopathies, (general introduction), haemophilias .2. von Willebrand disease 3. Other coagulopathies, platelet function disorders
Practical: Laboratory informatics

2nd week:
Lecture: 4. Inherited thrombophilias 5. Acquired thrombophilias 6. Prethrombotic state, thromboembolias, consumption coagulopathies
Practical: Laboratory diagnostics of coagulopathias

3rd week:
Lecture: 7. Disorders of sodium and water metabolism I8. Disorders of sodium and water metabolism II9. Disorders of sodium and water metabolism III.
Practical: Laboratory diagnostics of Thrombophilia. Laboratory monitoring of anticoagulant therapy

4th week:
Lecture: 10. Disorders of potassium metabolism11. Pathobiochemistry of the renal function I.12. Pathobiochemistry of the renal function II.
Practical: Laboratory diagnostics of platelet function disoerders. Laboratory monitoring of antiplatelet therapy

5th week:
Lecture: 13. Disturbances of the acid-base balance14. Laboratory diagnostics of renal disorders15. Pathogenesis and pathomechanism of diabetes mellitus
Practical: Laboratory diagnostics of renal disorders

6th week:
Lecture: 16. Laboratory diagnostics of diabetes mellitus 17. Pathobiochemistry and clinical biochemistry of the acute complications of diabetes mellitus 18. Hypoglycaemias
Practical: Examination of urine sediment
Self Control Test

7th week:
Lecture: 19. Disorders of lipid metabolism20. Laboratory diagnostics of hyperlipidemia21. 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 atherosclerosis24. Laboratory diagnostics of hyperuricaemia and gout
Practical: Drug monitoring

9th week:
Lecture: 25. Pathobiochemistry of liver disorders I.26. Pathobiochemistry of liver disorders II.27. Laboratory diagnostics of liver disorders. Pathobiochemsitry of acute hepatic disorders
Practical: Serum lipid measurements

10th week:
Lecture: 28. Pathobiochemistry and laboratory diagnostics of cholestasis and cirrhosis29. Pathobiochemistry and laboratory diagnostics of the gastrointestinal tract I.30. Pathobiochemsitry and laboratory diagnostics of the

gastorintestinal tract II.
Practical: Chromatography, respiratory test
Self Control Test

11th week:
Lecture: 31. Laboratory diagnostics of acute pancreatitis32. Clinical biochemsitry of hypothalamus and hypophysis33. Pathobiochemistry of thyroid disorders
Practical: Laboratory diagnostics of myocardial infarction

12th week:
Lecture: 34. Laboratory diagnostics of thyroid functions35. Clinical chemistry of parathyroid disorders36. Disorders of calcium, phosphate and magnesium metabolism
Practical: POCT

13th week:
Lecture: 37. Pathobiochemistry and laboratory diagnostics of adrenal cortex disorders38. Pathobiochemistry and laboratory diagnostics of adrenal medulla disorders39. Clinical biochemistry of gonadal functions
Practical: Laboratory evaluation of liver and pancreas function

14th week:
Lecture: 40. Laboratory diagnostics of muscle disorders41. Laboratory diagnostics of bone disorders 42. Demonsration of practical pictures
Practical: Laboratory evaluation of liver and pancreas function - case presentation
Self Control Test

15th week:
Lecture: 43. Summary of laboratory methods
Practical: Immunoassay

Requirements

Clinical Biochemistry - Participation on practicals: Attendance of practicals is obligatory. Altogether one absence in the first semester and two absences in the second semester are permitted. In case of further absences, the practicals should be made up for by attending the practicals with another group in the same week, or a medical certificate needs to be presented. Please note that strictly only a maximum of 3 students are allowed to join another group to make up for an absence.
Requirements for signing the Lecture book: The Department may refuse to sign the Lecture book if the student is absent from practicals more than allowed in a semester.
Assessment: At the end of the first and second semester there is a written examination (test) assessed by a five grade evaluation.
Requirements for examinations: The examination is based on the lecture and practical material (Practicals in Laboratory Medicine, eds.: János Kappelmayer and László Muszbek, 2010) as well as the relevant chapters from the textbook of Marshall and S.K. Bangert: Clinical Chemistry (7th edition, 2012).

Department of Pharmaceutical Chemistry

Subject: **PHARMACEUTICAL CHEMISTRY II. PRACTICE**
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.

Department of Pharmaceutical Chemistry

Subject: **PHARMACEUTICAL CHEMISTRY II. THEORY**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: Local anesthetics: natural compounds. Synthetic substances: esters, amides, ketones, ethers, urethanes and amidines. Spasmolytics: papaverin and its analogues. Bencyclan.

2nd week:
Lecture: Cardiovascular drugs. Antianginal compounds: nitrit- and nitrate esters. B-Adrenergic receptor-blocking agents. Inhibitors of the calcium channel, calcium antagonists. Another coronary dilators. Cardiotonics: cardial glycosides. Another types of cardiotonics. Antiarrythmic agents.

3rd week:
Lecture: Compounds controlling the blood pressure. Antihypertensives, hypotensives. Agents with central attack. Beta-receptor blockers, beta-adreno-receptor antagonists, adrenergic neuron-blockers. Vasodilators. Ganglionic blocking agents. Inhibitors of the angiotensin-converting enzyme. Peripheral dopamine-receptor agonists. Selective dilators of the cerebral blood-vessels. Anticoagulants.

4th week:
Lecture: Medicines of the hyperlipoidemia: clofibrate, nicotinic acid, lovastatin. Compounds effective on the hematopoiesis. Plasma substitutes. Substances effective on the hemostasis: anticoagulants, antithrombotics, inhibitors of platelet aggregation. Coagulants, derivatives of vitamin K. Fibrinolysis inhibitors.

5th week:
Lecture: Diuretics: xanthin and uracyl derivatives. Inorganic mercury salts. Sulfonamides, amino acids, cyclic amidines, aldosteron antagonists. Osmotic diuretics. Laxatives, choleretics. Antacid agents and obstipants.

6th week:
Lecture: Non-steroid anti-inflammatory agents: salicylates, arylalkanoic acids, N-arylanthranylic acids, 5-pyrazolone-derivatives. Antirheumatic agents: compounds of gold. 4-Amino-quinolines, thiols. Anti-gouty agents. Medicines of the immune system: immunostimulants. Immunosupressive agents. Vitamins.

7th week:
Lecture: Steroid hormones. Androgenes, anabolics, anti-androgenes. Oestrogenes, gestogenes, anticonceptives. Corticosteroids: mineralo- and glucocorticoids. Agents effective on the thyroid dysfunction. Antidiabetics. Prostaglandins.

8th week:
Lecture: Inorganiv and organic antiseptic agents, disinfectants. Alcohols, phenols, N-chloro compounds, surface active agents, dyes. Synthetic antibacterial agents. Sulfonamides, nitrofuran derivatives.

9th week:
Lecture: Fluoroquinolones. Antifungal compounds: imidazoles, triazoles, Antifungal antibiotics: polyenes, griseofulvin.

10th week:
Lecture: Antibacterial antibiotics.Cyclopeptides, lipo-glyco- and depsipeptides. Beta-lactam antibioics. Penicillins: natural and semi-synthetic penicillins. Beta-lactamase inhibitors.

11th week:
Lecture: Natural and semi-synthetic cephalosporins. Carbacephems. Monocyclic B-lactams.

12th week:
Lecture: Aminocyclitol (aminoglycoside) antibiotics. Macrolide antibiotics, erythromycin and semisynthetic derivatives. Ansa-macrolides. Natural and semi-synthetic tetracyclins.

13th week:
Lecture: Medicines of the parasitic diseases. Antimalarial agents: quinine and other derivatives. Antiprotozoal agents. Medicines of toxoplasmosis and amoebiasis. Trichomonacide and trypanocidal substances. Anthelminics.

14th week:
Lecture: Antiviral compounds: Acyclovir, Ribavirin, Zidovudin. Neuraminidase inhibitors Antineoplastic agents: cytostatic compounds. Folic acid-, purin-, and pyrimidin-antagonists. Nucleoside antagonists.

15th week:
Lecture: Biological alkylating compounds: nitrogen and phosphamide-mustards. Aziridines, methanesul-fonates, diepoxides. Platinum derivatives. Anthracyclineglycosides. Taxol. Targeted chemotherapy, specific kinase inhibitors, use of MAB-based therapy.

Requirements

Attendance to lectures is emphatically recommended. All material covered in lectures is an integral part of the subject and therefore included in the self-control tests and the final exam. Several new concepts and ideas are discussed in the lectures only and are not present in the textbook. Final examination is possible only after succesfully finished and accepted laboratory practices 1+2.

Department of Pharmaceutical Technology

Subject: **3RD YEAR SUMMER PRACTICE FOR PHARMACY STUDENTS**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **120**

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY III. PRACTICE**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Practical: **120**

1st week:
Practical: Course: Prescription Pharmacy Introduction, general information. Labour safety, laboratory regulations. Requirements. Preparations of pastes. 1. Pasta boraxata FoNo VII. 2. Pasta Burowi FoNo VII. 3. Sirupus kalii chlorati FoNo VII. Course: Sterile and aseptic formulations Parenteral nutrition. Dialyzing. Peritoneal dialysis. Solutio pro dialysi peritoneale I. (Ph.Hg VII.) Solutio pro dialysi peritoneale II. (Ph.Hg VII.)

2nd week:
Practical: Course: Prescription Pharmacy Vaginal dosage forms (ovulum, globulus, globulus vaginalis longiformis), Preparation of suppositories by the help of cold compression with Theobroma oil. 1. Ovulum nystatini FoNo VII. 2. Globulus glycerini boraxati FoNo VII. 3. Globulus zinci sulfurici (individual composition) (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. Procainium chloratum 0,1g. Aqua dest. pro inj. ad 500ml. Collins I.solution (SZOTE). Kalium dihydrogenphosphoricum 2,05g. Kalium hydrophosphoricum 9,70g. Kalium chloratum 1,12g. Natrium hydrogencarbonicum 0,84g. Aqua dest. pro inj. ad 1000ml.

3rd week:
Practical: Course: Prescription Pharmacy Divided powders. 1. Pulvis antidoloricus FoNo VII. 2. Pulvis asthmalyticus fortis FoNo VII. 3. Pasta contra solarem FoNo VII. 4. Cremor aquosus FoNo VII. Course: Sterile and aseptic formulations Plasma substitute infusion solutions. Cardiostop solutions. Cardiostop I. solution. Natrium chloratum 0,4g. Kalium chloratum 0,3g. Magnesium chloratum sol. 50% 0,3g. Glucosum anhydricum 1,5g. Mannitum 20,6g. Aqua dest. pro inj. ad 500,0ml. Solutio anticoagulans ACD(Ph.Hg.VII.).

4th week:
Practical: Course: Prescription Pharmacy Incompatibilities. 1. Incompatibility 1. 20,0g 2. Incompatibility 2. 150,0g 3. Incompatibility 3. 100,0g 4. Incompatibility in suppository. (Codein. 0,24g; Aspirin 3,00g, Phenacetin 3,00g, Adeps solidus 3 instead of Adeps solidus 50) Course: Sterile and aseptic formulations, Ophthalmic ointments, Oculentum simplex Ph.Hg.VII. 50,0g, Oculentum hydrosum Ph.Hg.VII 20,0g, Oculentum neomycini FoNoVII 10,0g

5th week:
Practical: Course: Prescription Pharmacy Sparsorium. 1. Sparsorium antisudoricum FoNo VII. 2. Sparsorium contra pruritum FoNo VII. 3. Incompatibility 4. 30,0g (ointment) 4. Incompatibility 5. 10p.(powder) Course: Sterile and aseptic formulations. Test.

6th week:
Practical: Course: Prescription Pharmacy Test 1. Course: Formulation of tablets and granules. Repetition: Tablets and granules. Preparation: Tabletta aminophenazoni.

7th week:
Practical: Course: Prescription Pharmacy 19. Incompatibility 6. (talc) 20. Sparsorium infantum FoNo VII. 21. Pasta antirheumatica FoNo VII. 22. Pulvis combinatus FoNo VII. Course: Formulation of tablets and granules. Tableting. Quality control of tablets. Preparation: Tabletta coffeini.

8th week:
Practical: Course: Prescription Pharmacy 23. Suppositorium algopyrini FoNo VII. 24. Unguentum infantum FoNo VII. 25. Pulvis chinacisalis cum vitamino C FoNo VII. 26. Suspensio bismogeli FoNo VII. Course: Formulation of tablets and granules. Quality control of tablets and granules.

9th week:
Practical: Course: Prescription Pharmacy 27. Suppositorium ad nodum FoNo VII. 28. Unguentum anaestheticum FoNo VII. 29. Cremor erythromycini FoNo VII. 30. Pulvis spasmalgeticus FoNo VII. Course: Formulation of tablets and granules. Quality control of tablets. Individual and average weight. Test of disintegration. Test of mechanical hardness.

10th week:
Practical: Course: Pharmacy Prescriptions in clinical practice 31. Solutio cacisali 32. Globulus with chamomillae 33. Ointment for hands 34. Mucilage for urine tract. Course: Formulation of tablets and granules. Test.

11th week:
Practical: Course: Prescription, Pharmacy Individual drug preparation practice. Course: Galenic preparations and their manufacture. Preparation and investigation of ointments and creams.

12th week:
Practical: Course: Prescription Pharmacy 35. Mixtura pectoralis adde Dionin FoNo VII. 36. Suppositorium antipyreticum pro parvulo FoNo VI. 37. Pulvis paracetamoli cum codeino FoNo VII. 38. Unguentum antirheumaticum FoNo VII. Course: Galenic preparations and their manufacture. Preparation and investigation of suspension ointments and pastes.

13th week:
Practical: Course: Prescription, Pharmacy Test 2. Course: Galenic preparations and their manufacture. Preparation and investigation of suppositories.

14th week:
Practical: Course: Prescription, Pharmacy 39. Unguentum antiphlogisticum pro infante FoNo VII. 40. Unguentum ichthyolsalicylatum FoNo VII. 41. Pulvis cholagogus FoNo VII. 42. Unguentum dermophylicum FoNo VII. Course: Galenic preparations and their manufacture. Preparation and investigation of powders.

15th week:
Practical: Course: Prescription, Pharmacy Supplemental practice. Consultation. Correction. Course: Galenic preparations and their manufacture. Test.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY III. THEORY**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Powders. Methods of dezintegration. Special thematic for the measurement of powder-technology, rotation properties, particle size, particle distribution, particle form, density, special surface, porosity, water content. Dusting powder.

2nd week:
Lecture: Tablets. Definitions, grouping, requirements. Methods of pressing. Manifestations that occur during pressing. (bounding mechanisms, energy conditions)

3rd week:
Lecture: Granules. Theoretical bases of the formulation of granules. Types of bandage. Modes for the formulation of granules. Dry and wet granulation. Structure granulation. Granulation with fluidization.

4th week:
Lecture: Ingredients of tableting and granulation. (Diluents, desintegration agents, binders, adsorption agents, moisture maintain agents, hydro-phylizating agents, glidant, lubricant, antiadhesion agents, antistatic agents, dyes, colouring agents.). Investigation of tablets and granules.

5th week:
Lecture: Dragée. The process of coating. The methods of coating (sugar coating, film coating, gastric coating, enteric coating.). Dry coating.

6th week:
Lecture: Formulation of dragée by fluidization. Equipment for coating. Dragée core and the temperature of drying. Investigations of dragée.

7th week:
Lecture: Capsules. Hard gelatine capsules. Soft gelatine capsules, formulation, filling. Intestinosolvent capsules. Wafer-capsules. Investigation of capsules.

8th week:
Lecture: Microcapsulation. (molecular cap-sulation), nanocapsulation, liposomes, structure of liposomes,

ormulation of liposomes. Pharmaceutical liposomes. Cosmetics.

9th week:
Lecture: Pharmaceutical dosage forms formulated by extraction. Basic requirements of extraction. Factors influenced by extraction. Methods of extraction. (Maceration, turbo-extraction, hydro-extraction, perfusion extraction, extraction with reverse flow.) Extracts, tinctures. Decoctions, Infusions. Tea-mixtures. Proper formulation method of therapeutic teas.

10th week:
Lecture: Homeopathic preparations and pharmaceutical forms. What is a homeopathic drug? Homeopathic pharmaceutical bases, drug-transfers and ingredients. Preparations. Guides for the formulation of homeopathic preparations. OGYI. Important preparations. A:U:V:

11th week:
Lecture: Bandage. Bases of bandage (cellulose, polimer, intermediate agents). Covering injuries, the material of bandage. Cotton wool. Fixing bandage and it's material. Investigation of bandage.

12th week:
Lecture: Primer packing materials. Describing primer packing materials and containers.: glass, plastic. Investigations. Special packing materials.

13th week:
Lecture: The connection between drug formulation and technological chemistry.

14th week:
Lecture: Consultation.

15th week:
Lecture: Consultation

Requirements

3rd semester of Pharmaceutical technology consisting of 15 weeks in the second semester in the year 3.

CHAPTER 18
ACADEMIC PROGRAM FOR THE 4TH YEAR

Department of Biopharmacy

Subject: **PHARMACEUTICAL AND BIOANALYTICAL CHEMISTRY I.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**

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.

Department of Medical Microbiology

Subject: **MEDICAL MICROBIOLOGY I.**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**
Seminar: **10**
Practical: **10**

1st week:
Lecture: The microbial word. Pharmaceutical importance of microbes. Prokaryotic cell structure.
Practical: Laboratory safety instructions. Bacterial normal flora. Collection of clinical samples, sample processing.

2nd week:
Lecture: Morphology and physiology of bacteria. Pathogenesis and infection. Bacterial genetics.
Practical: Examination of microscopic morphology of bacteria. Microscopic techniques (dark field and phase contrast microscope, electron microscopy). Unstained specimens. Staining methods (Gram-, Ziehl-Nielssen-and Neisser- staining).

3rd week:
Lecture: Host defenses against bacterial infections. Immunological basis of vaccination.
Practical: Culture techniques (culture conditions, media, colony morphology). Identification of bacteria (examination of biochemical activity). Diagnosis of anaerobic infections.

4th week:
Lecture: Passive and active immunization. Immunoglobulins. Vaccines.
Practical: Immunoserological methods in microbiological diagnosis (precipitation, agglutination, complement fixation, ELISA and westernblot).. Molecular diagnostic methods.

5th week:
Lecture: Gram-positive cocci and rods. Gram-negative cocci. Acid-fast bacteria.
Practical: Bacterial respiratory tract diseases. Central nervous system diseases caused by bacteria.

6th week:
Lecture: Gram-negative coccobacilli. Gram-negative rods. Curved rods.
Seminar: Diagnosis of enteric bacterial infections.

7th week:
Lecture: Mycoplasms and obligatory intracellular bacteria. Spirochaetes.
Seminar: Urinary tract infections. Bacterial sexually transmitted diseases (STD)

8th week:
Lecture: Principles of antibacterial chemotherapy, major groups of antibiotics and their mechanism of action. Mathematical description of the antibiotic effect. Antibiotic policy.
Seminar: Self-control test.

9th week:
Lecture: Cell wall synthesis inhibitors.
Seminar: Development and clinical trial of antibiotics.

10th week:
Lecture: Protein synthesis inhibitors.
Seminar: Methods for testing antibiotic susceptibility. Examination of antibiotic interactions.

11th week:
Lecture: Antibiotics interfering with nucleic acid metabolism and antimetabolite antibiotics.
Seminar: Antibacterial agents for the treatment of meningitis and urinary tract infections. Antibiotics against anaerobic bacteria.

12th week:
Lecture: First-line and second-line antituberculotics, drugs against leprosy and against atypical mycobacteria. Fungal cell structure. Medically important fungal pathogens.
Seminar: Types and mechanisms of clinically relevant antibiotic resistance.

13th week:
Lecture: Antifungal agents.
Seminar: Diagnosis of fungal infections. Antifungal agents for local treatment.

14th week:
Lecture: General properties of viruses. Pathogenesis of viral infections. Replication of viruses, replication strategies.
Seminar: Self-control test.

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. Missed practice or seminar may be made up with another group in the same week only. Two mid-semester self-control tests are written during the 1st semester. The self-control tests are compulsory.

At the end of 1st semester the student is required to take an end-semester examination (written entry test and oral exam) based on the whole material of the lectures, practices and seminars of the semester. Based on the cumulative results of the mid-semester self-control tests, students are offered an End-Semester-Examination (ESE) grade. Those who are not satisfied with the offered grade or are bellow the passing level (60%), should sit for an end- semester-examination (A-chance) hold in the examination period.

At the end of the 2nd semester the student is required to take a final examination (written entry test and oral exam) based on the whole material taught in the Medical Microbiology course.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY IV. PRACTICE**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Practical: **45**

1st week:
Practical: Requirements against injections. Guidelines of preparation of injections. Excipients and solvents of injections. Controlling of injections. Containers. Preparation: Injectio natrii chlorati 100mg/ml (Ph.Hg.VII.). Injectio kalii chlorati 100mg/ml (Ph.Hg.VII.)

2nd week:
Practical: Powder, tablets for injection. Freeze-dried preparation for injection. Emulsion and suspension for injection. Preparation: Injectio magnesii sulfurici 10%. Injectio papaverinii hydrochlorici 1,0%

3rd week:
Practical: Multidosage injections. Preparation of hydrolysis-susceptible injections. Preparation: Injectio procainii chlorati 20mg/ml (Ph.Hg.VII.). Injectio atropinii sulfurici 1mg/ml (Ph.Hg.VII.).

4th week:
Practical: Preparation of thermounstable injections. Preparation of oxidation sensitive injections. Preparation: Injectio aethylmorphinii chloratii 20mg/ml. Injectio acidi ascorbici 10%.

5th week:
Practical: Quality control of injection. Measuring pH, controlling visible particles and fibres. Test.

6th week:
Practical: Tablet preparation practice (15 hours). Tablet coating I.: sugar coating.

7th week:
Practical: Tablet coating I.: film coating.

8th week:
Practical: Modified-release tablets.

9th week:
Practical: Dissolution test for tablets.

10th week:
Practical: Quality control of coat and coated tablets. Test.

11th week:
Practical: Pharmaceutical Care practice (15 hours). Introduction: The history of clinical pharmacy, pharmaceutical care and medical therapy management and their national and international approach and practice.

12th week:
Practical: Self-medication, self-treatment: medications at home, medications by travel, OTC medications.

13th week:
Practical: Diagnostics in the pharmacy: blood-sugar test, determination of bloodpreasure and lipid-rate, pregnancy/ovulation tests, candida test, drug test.

14th week:
Practical: Special Therapeutical Systems in the pharmacy. Programs in Pharmaceutical Care in Hungary: Diabetes Program, Hypertonia Program, Dyslipidaemia Program.

15th week:
Practical: Summary. Test.

Department of Pharmaceutical Technology

Subject: **PHARMACEUTICAL TECHNOLOGY IV. THEORY**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Biopharmaceutical requirements during planning and evaluating pharmaceutical dosage forms. Basic principles, definitions. LADMER-model. Basic principles of pharmacokinetics. Kinetic of adsorption and elimination. Biological half-time. Anatomical and physiological investigation of resorption. Resorption.

2nd week:
Lecture: Bioavailability and bioequivalence. Definitions. Definition of bioavailability (basic principles and possibilities). Possibilities for influencing bioavailability with instruments used in pharmaceutical technology.

3rd week:
Lecture: Physical and physicochemical properties of the active agent, distribution coefficiens, lipophylia, value of pK, dissolution and speed of dissolution, the influence of particle size, polimorphous, salt, prodrug, chemical stability of active agent, the influence of ingredients.

4th week:
Lecture: Formulation process, influence on drug formulation. Other possibility for influencing bioavailability/physiological facts, drug interactions, influence of food-products: first-pass effect, pathological states.

5th week:
Lecture: In vitro methods for the release of active-agents. Correlation between in vitro/in vivo methods. Investigations of drug release, instruments.

6th week:
Lecture: Retard and depot drug forms. Definitions. Therapeutic aims. Biopharmaceutical bases. Criteria for the active agents of depot drug-forms. Processes for lengthening the effective time of active agents. Therapeutic processes, chemical processes, technological possibilities.

7th week:
Lecture: Retard oral preparations. Pharmacokinetical bases of planning oral retard preparations. Planning of drug preparations with the dissolution of null and first order. Controlling the bioavailability and bioequivalence of retard oral preparations.

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

9th week:
Lecture: Therapeutic systems: basic principles. Local therapeutic systems. Transdermal therapeutic systems. Oral therapeutic systems, parenteral therapeutic systems.

10th week:
Lecture: Pharmaceutical dosage forms of the future. Development tendencies. Organ specific transport of the pharmaceutically active agents. Drug targeting. Development of drug formulations, controlled release of the active agent. Optimizing the available drug preparations. New methods of administration.

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

13th week:
Lecture: Modern drug forms I. Drugs with fluid-crystals. Therapeutic nail polish. Microemulsions as the new transporter systems for active agents. Formulation of parenteral microemulsions. V/o/v emulsions in cosmetics.

14th week:
Lecture: Modern drug forms II. Nanoparticles. Solid nanoparticles. Lipidprodrug and pharmacosom. Nanosuspensions. Polimeric submicron emulsions as systems for drug-transport.

15th week:
Lecture: Consultation.

Department of Pharmacology

Subject: **PHARMACOLOGY I. PRACTICE**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction to pharmacology.

2nd week:
Practical: Receptors and signaltransduction.

3rd week:
Practical: Neurotransmission and neurotransmitters in the CNS.

4th week:
Practical: General anesthetics.

5th week:
Practical: Sedatohypnotics. Antidepressants and lithium. Antipsychotics.

6th week:
Practical: Antiepileptics.

7th week:
Practical: Pharmacologic management of Parkinsonism.

8th week:
Practical: Drugs used in Alzheimer's Disease.

9th week:
Practical: Migraine.

10th week:
Practical: Central and peripheral skeletal muscle relaxants.

11th week:
Practical: Drugs with important actions on smooth muscle. Local anesthetics.

12th week:
Practical: Basic pharmacology.

13th week:
Practical: Cholinerg-activating and cholinoceptor-blocking drugs.

14th week:
Practical: Adrenoceptor-activating and blocking drugs.

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

Requirements

During the semester students have to take two oral 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 avarage of the two mid-semester exams provides the grade of the Assessment of Workmanship (AW5) for the Pharmacology I. practice. Further correction of this grade is not an option.

Department of Pharmacology

Subject: **PHARMACOLOGY I. THEORY**
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 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 oral 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.
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.

Department of Preventive Medicine, Faculty of Public Health

Subject: **PREVENTIVE MEDICINE AND PUBLIC HEALTH**
Year, Semester: 4th year/1st semester
Number of teaching hours:
Lecture: **30**
Seminar: **22**
Practical: **8**

1st week:
Lecture: 1. The history, scope and methods of public health and preventive medicine, major public health issues in developing and developed countries 2. Introduction to human ecology
Seminar: 1-2. Principles of prevention

2nd week:
Lecture: 3. Air pollution and health4. Water pollution and health
Seminar: 3-4. Demographic methods to study the health status of the population

3rd week:
Lecture: 5. Health effect of the occupational environment. I. Physical hazards 6. Health hazards of ionising radiation and radioactive substances
Seminar: 5-6. Occupational health and safety in pharmacist practice.

4th week:
Lecture: 7. Health effects of the occupational environment. II. Toxicology of inorganic industrial toxicants 8. Health effects of the occupational environment. III. Toxicology of organic solvents and pesticides
Practical: 7-8. Chemical and microbiological examination of drinking water (laboratory practice for small groups)

5th week:
Lecture: 9. The general effect of environmental pollution 10. Lifestyle and health
Practical: 9-10. Chemical and microbiological examination of drinking water (laboratory practice for small groups)

6th week:
Lecture: 11. Healthy nutrition. Nutritional deficiency disorders 12. Food poisoning
Seminar: 11-12. Mercury toxicity, case study

7th week:
Lecture: 13. Public health consequences of substance abuse14. Social factors and health
Seminar: 13-14. Health promotion

8th week:
Lecture: 15. Epidemiology of respiratory diseases16. Epidemiology of skeletal and dental diseases I
Seminar: 15-16. Health education

9th week:
Lecture: 17. Public health problems of disadvantaged people18. Introduction into the general epidemiology of non-communicable diseases
Seminar: 17-18. Epidemiological measures

10th week:
Lecture: 19. Epidemiology of neoplastic diseases20. Epidemiology of cardiovascular diseases
Seminar: 19-20. Epidemiological studies

11th week:
Lecture: 21. Epidemiology of skeletal and dental diseases

II22. General epidemiology of communicable diseases
Seminar: 21-22. Preventive strategies

12th week:
Lecture: 23. Epidemiology of respiratory infectious diseases24. Infection control and pharmacy
Seminar: 23-24. WHO/HFA database

13th week:
Lecture: 25. Communicable diseases transmitted through the skin 26. Epidemiology of sexually transmitted diseases and AIDS
Seminar: 25-26. Reporting and control of communicable diseases, vaccination

14th week:
Lecture: 27. Epidemiology of viral hepatitis28. Health policy principles
Seminar: 27-28. Sterilization and disinfection

15th week:
Lecture: 29. Health care systems of developed countries 30. Needs, demands and use of health services
Seminar: 29-30. Central Sterilization Unit of the Medical University (visit)

Requirements

Requirements for signing the lecture book
Attendance of lectures is highly recommended. Attendance of the seminars, practices and visits is obligatory. The head of the department may refuse to sign the lecture book if a student is absent more than two times from seminars (including visits) in the semester even if he/she has an acceptable excuse.
Requirements for the final exam
The final exam involves written and oral sections covering the topics of all lectures and seminars of the subject. The oral exam covers the topics of all seminars and practices of the semester. The written exam consists of multiple choice test questions related to Environmental Health, Epidemiology and Health Policy. The final exam is assessed on the basis of the average of four marks and it is failed if either the oral or any part (Environmental Health, Epidemiology, Health Policy) of the written exam is graded unsatisfactory. Students should repeat only those section(s) of the final exam that has/have been previously unsuccessful. In this case the final exam is graded according to the average of the passing marks obtained on the first and repeated exams.
Course description
The course covers the main areas of public health: environmental health including the health consequences of air and water pollution, occupational and nutritional health; the principles of epidemiology, the epidemiology and control of communicable and non-communicable diseases. Special attention is given on the main topics underlying nutritional disorders and deficiencies, health hazards of pharmacist' practice and preventive strategies.
Requirements
To acquire knowledge about the principles and the most important issues of environmental health, communicable and non-communicable diseases and health policy.
Methods of education
The education of the subject is based on lectures, seminars, laboratory practices and visits. The practical adaptation of the topics of lectures are highly promoted by seminars. Students will learn about the major public health issues in developing and developed countries and organisation of public health services. The practices are closely related to the environmental health part of the course. During the epidemiology seminars students will learn how to calculate the most important indicators for the measurement of morbidity and mortality. In addition, the epidemiology of communicable and non-communicable diseases will be discussed in detail.
Prerequisite:
immunology, pathology II.

Department of Behavioural Sciences, Faculty of Public Health

Subject: **BIOETHICS**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: The concept of bioethics. The distinction between traditional medical ethics and modern bioethics: (1) wider scope and (2) new (society- and patient-oriented) attitude. The emergence of bioethics and the major (social, historical, scientific and philosophical) factors playing central roles in it. Bioethics and pharmacology.

2nd week:
Lecture: The four basic principles of bioethics: (1)

nonmaleficence; (2) beneficience; (3) autonomy; (4) justice. The importance of antipaternalism. The role of classic or modern medical oaths in bioethics. International declarations regarding medical and pharmacological ethics.

3rd week:
Lecture: Patients' rights. The importance of the patients-oriented approach. The Hungarian legal regulations of patients' rights in the light of an international comparison.

4th week:
Lecture: The principle of informed consent. The different aspects of providing appropriate information to patients. Theory and practice of risk communication. The bioethics of the so-called Evidence-Based-Medicine.

5th week:
Lecture: The ethics of scientific research and publications. The very basics of philosophy of science. The ethical problems raised by the recent tendency of commercialization of scientific, medical and pharmaceutical research. The ethical problems of scientific openness. Public vs. private scientific research. The ethics of scientific research and publication in the special area of pharmaceutical research. The ethical relevance of the so-called conflict of interests (a central problem of current bioethics).

6th week:
Lecture: Ethical questions of advertisement of medical tools (drugs etc.). Drugs in the market. The special ethical questions regarding direct-to-consumer (DST) advertisements.

7th week:
Lecture: The ethics of current biotechnology. Various ethical questions raised by recent and future advances of genetics, robotics, nanotechnology, pharmacology and brain-sciences.

8th week:
Lecture: The ethical aspects of medical experiments on human beings. The principle of informed consent. The history of experimentations on humans. The Nurenberg Code (1947). The Helsinki Declaration (1964). The ethics of double-blind experimental set-ups. The importance of the placebo-effect.

9th week:
Lecture: The ethical aspects of medical experiments of non-human animals. The possiblitity of extrapolations of the results of animal experiments to human anatomical, physiological and mental phenomena in the lights of current evolutionary theory. The essential ethical questions concerning the ethical acceptibility of animal experimentations in medical and pharmaceutical research. The history of animal well-being, animal liberation and animal rights (as well as environmental ethics) movements.

10th week:
Lecture: Psychiatric ethics/neuroethics. The different approaches to diseases. (What is a disease? What is normal?) How can we make a difference between medically normal and abnormal people? Introduction to philosophy of medicine.

11th week:
Lecture: The distinction between therapy and enhancement: one of the central topics of current bioethics (with a special emphasis on pharmacological ethics).

12th week:
Lecture: Ethical questions of current reproductive technologies. The ethics of abortion and infanticide. Where human life begins?

13th week:
Lecture: End-of-life decisions in current bioethics. Ethical questions concerning death, living will, transplantations, euthanasia, physician-assisted suicide and hospices. The right to die debate. Current neuroscience and bioethics.

14th week:
Lecture: The justice-principle. Questions about local and global justice in medicine (with special attention to pharmacological aspects). What does just allocation of constrained resources mean? Should we provide poor countries with expensive life-saving drugs? The effects of globalization on bioethics/pharmacological ethics.

15th week:
Lecture: Written exam.

Requirements

Attendance in the lectures is required. Usable understanding of the core theoretical concepts and conceptions is required as well as the knowledge on the actual patients' rights regulation.

Department of Biopharmacy

Subject: **PHARMACEUTICAL AND BIOANALYTICAL CHEMISTRY II.**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**
Practical: **90**

1st week:
Lecture: Immunoanalytical methods I.: Southern-blotting, Northern-blotting, Western-blotting, dot-blot
Practical: Introduction, laboratory safety instructions.

2nd week:
Lecture: Immunoanalitycal methods II.: RIA, ELISA, FISH, IHC.
Practical: UV-VIS spectrophotometry

3rd week:
Lecture: Isolation of nucleic acids, types of gel electrophoresis, SCG, DNS-chip, Comet assay.
Practical: Gas chromatography (GC).

4th week:
Lecture: PCR, RT-PCR: basic principles and practical applications.
Practical: High Performance Liquid Chromatography (HPLC).

5th week:
Lecture: Synthesis of oligonucleotides and peptides. Sequencing of nucleic acids and proteins.
Practical: Protein isolation.

6th week:
Lecture: Basic principles of proteomics, applications in medical and pharmaceutical research.
Practical: Western-blot

7th week:
Lecture: 1th control testNMR and ESR: Basics and application in the pharmaceutical research and clinical diagnosis.
Practical: Isolation of nucleic acids, agarose gel electrophoresis.
Self Control Test

8th week:
Lecture: Analytical techniques in clinical diagnosis of selected diseases, laboratory tests.
Practical: Immunohistochemistry.

9th week:
Lecture: Therapeutic Drug Monitoring.
Practical: TLC

10th week:
Lecture: Toxicology. Instrumental analysis of some selected drugs.
Practical: RIA, ELISA.

11th week:
Lecture: Bioanalysis: the role and importance of bioanalytical experiments in drug research and drug development.
Practical: NMR (demonstration).

12th week:
Lecture: Analytical aspects of quality insurance in the pharmaceutical industry.
Practical: ESR (demonstration).

13th week:
Lecture: Analytical aspects of human drug development.
Practical: GC-MS (demonstration)

14th week:
Lecture: Environmental rules, prescriptions and applied analytical methods and techniques in the pharmaceutical industry.
Practical: Consultation.

15th week:
Lecture: 2nd control test.
Self Control Test

Requirements

At least 30 % of the lectures must be visited. Students have to write two control test, on 7th, and 15th week. If the results of the tests will not be at least 60%, the students will not be able to take oral exam .
Obsense of more than one practice is not allowed during the semester. The missed practice can be made up exclusively on the 14th week of the semester. Only students having adequately fulfilled the requirements of practice are allowed to get the signature and to take the final oral exam.

Department of Internal Medicine

Subject: **CLINICAL BASICS**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **65**
Seminar: **30**

1st week:
Lecture: INTERNAL MEDICINE1. Autoimmune diseases.2. Inflammatory lung disease. 3. Asthma bronchiale, chronic bronchitis, emphysaema. 4. Pulmonary tumour.5. Type I, II diabetes mellitus and its treatment.

2nd week:
Lecture: 6. Infective endocarditis and its prevention.7. Anticoagulant treatment in heart diseases.8. Heart failure and pacemaker treatment.9. Angina pectoris. Myocardial infarction. 10. Arrhythmias.

3rd week:
Lecture: 11. High blood pressure. Complication and treatments.12. Urgency in high blood pressure.13. Gallstones and acute chronic pancreatitis. 14. Diseases of hypophysis and adrenals.15. Diseases of thyroid and parathyroid glands.

4th week:
Lecture: 16. Diseases of oral cavity. 17. Disease of oesophagus. Acute, oral chronic gastritis.18. Examination methods of gastrointestinal tract. Peptic ulcer.19. Metabolic X-syndrome.20. Drug dosage in renal insufficiency and old age.

5th week:
Lecture: 21. Cancer of stomach.22. Inflammatory bowl disease, Crohn disease, ulcerative cholitis. Cholitis indicated by antibiotic treatment. 23. Gluten sensitive enteropathy, irritable colon syndrome.24. Acute hepatitis, chronic hepatitis.25. Hepatic cirrhosis. Obesity.

6th week:
Lecture: 26. Polycythaemai, myelofibrosis, anaemia.27. Myeloma multiplex, Waldenström macroglobulinaemia.28. Kidney function.29. Acute and chronic glomerulonephritis. Autoimmune nephropathies.30. Interstitial nephritis. Acute and chronic renal failure.

7th week:
Lecture: 31. Inherited and acquired haemophilias. 32. Thromboembolism.33. Acute and chronic leukaemia.34. Anaemias.35. Hodgkin and non-Hodgkin lymphoma.

8th week:
Lecture: SURGERY36. Shock, asepsis, antisepsis.37. Pain killing in surgery.38. Oncology – surgery.39. Wounds and healing of wounds. (TRAUMATOLOGY)40. Trauma (TRAUMATOLOGY)

9th week:
Lecture: PEDIATRY41. Nephrology42. Vomiting and diarrhoea in 1st year of life.43. Cardiology44. Haematology45. Neurology.

10th week:
Lecture: 46. Congenital development disorder.47. Growing and mental development in the 1st years of childhood.48. Antibiotic therapy in early age.49. Allergy.50. Respiratory organs diseases in early age

11th week:
Lecture: NEUROLOGY, PSYCHIATRY51. Epilepsy52. Headache.53. Stroke

12th week:
Lecture: 54-55. Cancer of CNS. (NEUROSURGERY)

13th week:
Lecture: 56. Alcohol and drug dependences.57. Depressive and panic diseases.58. Drugs and therapy in psychiatry.

14th week:
Lecture: OBSTETRICS, GYNECOLOGY59. Birth control pills and its side effects. Climax and hormone therapy.60. Pharmacotherapy during pregnancy, side effects.61. Inflammatory diseases of female organs.62. Pharmacotherapy during birth and nursing.63. Evidences based pharmacotherapy.

15th week:
Lecture: 64. Disorders in puberty. Normal pregnancy, prenatal care. 65. Problems of menstruation. Sterility and hormone therapy.66. Benign and malignancy tumour of the female reproductive organs.
Self Control Test

Department of Medical Microbiology

Subject: **MEDICAL MICROBIOLOGY II.**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Seminar: **15**
Practical: **15**

1st week:
Lecture: Herpesviruses.
Seminar: Direct detection of viruses. Propagation of viruses, detection of virus replication.

2nd week:
Lecture: Hepatitis viruses
Seminar: Detection of viruses by serological tests. Molecular virology.

3rd week:
Lecture: Medically important RNA viruses
Seminar: Congenital and neonatal virus infections.

4th week:
Lecture: Medically important arbo- and roboviruses. Rabies virus
Seminar: Viral vaccines.

5th week:
Lecture: HIV virus.
Seminar: Opportunistic infections.

6th week:
Lecture: Antiviral agents.
Seminar: Determination of susceptibility to antiviral agents.

7th week:
Lecture: Medically important protozoal infections.
Seminar: Antimalarial agents. Antiprotozoal drugs.

8th week:
Lecture: Medically important cestodes.
Seminar: Anthelmintic drugs I.

9th week:
Lecture: Medically important nematodes.
Seminar: Anthelmintic drugs II.

10th week:
Lecture: Ectoparasitic infections.
Seminar: Drugs against ectoparasites.

11th week:
Lecture: Sterilization procedures and sterility assurance.
Seminar: Sterilization and disinfection I.

12th week:
Lecture: Disinfection, groups of disinfectants and their mechanism of action.
Seminar: Sterilization and disinfection II.

13th week:
Lecture: Microbial contamination and spoilage of pharmaceutical products. Preservatives.
Seminar: Standards of microbial purity of pharmaceutical products.

14th week:
Lecture: Pre-, pro- and synbiotics.
Seminar: Microbial control of immunological 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. Missed practice or seminar may be made up with another group in the same week only. At the end of the 2nd semester the student is required to take a final examination (written entry test and oral exam) based on the whole material taught in the Medical Microbiology course.

Department of Pharmaceutical Surveillance and Economics

Subject: **PHARMACEUTICAL MANAGEMENT AND ORGANISATION**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: The surrounding health system around the Hungarian Pharmacy. Drug consuption and sales. The top pharmaceutical companies and their top products, Drug consumption in Hungary in an international comparison.

2nd week:
Lecture: The preclinical and clinical phases of the drug research and development Generics, bioequivalence studies.

3rd week:
Lecture: Health financing and the drug reimbursement system. Pharmacy reimbursement. The structure of the drug prices. Something about quality assurance: GMP, GLP, GCP, GPP.

4th week:
Lecture: Drug utilization, its advantages, the ATC system, DDD, DOT. The wholesalers. The pharmacy sales.

5th week:
Lecture: The legal behind of the Pharmacy system, Drug registration. The roles of the Health Authorities and the National Pharmacy Officer.

6th week:
Lecture: Basics of drug economy and the Evidence Based Medicine. The professional organisations in the Pharmacy system.

7th week:
Lecture: Drug marketing. Life cycle of the drugs. Generics. OTC drugs.

8th week:
Lecture: Drug informations, advertisement, medical and pharmacy representatives. Pharmaceutical Care. Ethical issues in the pharmaceutical care. Ethical Codex. Pharmacovigilance.

Department of Pharmaceutical Technology

Subject: **CLINICAL PHARMACY**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**
Seminar: **30**

1st week:
Lecture: Introduction, definitions. Basic principles. What is Clinical Pharmacy?
Seminar: Introduction, general information.

2nd week:
Lecture: Drug order, dispensing and control. Arts of order. Failure during drug ordering. Drug safety (unit dose system, role of clinical pharmacist). Drug dispensing system. Drug information.
Seminar: Adverse drug events, side effects I.

3rd week:
Lecture: The role of clinical pharmacist in a patient treatment.
Seminar: Adverse drug events, side effects II.

4th week:
Lecture: Therapeutic drug monitoring.
Seminar: Adverse drug events, side effects III.

5th week:
Lecture: Infusion systems. Basic principles. Formulation of infusions. Investigation of infusions. Special infusion systems. Incompatibility and instability. Iv additives and its compatibility. Plastic bags. Cytotoxic drugs.
Seminar: Adverse drug events, side effects IV.

6th week:
Lecture: Clinical nutrition. Enteric and parenteric nutrition. Total parenteric nutrition. Parenteric nutritive infusions, fat emulsions. "All in one" mixtures.
Seminar: Adverse drug events, side effects V.

7th week:
Lecture: Compliance, non-compliance. Pharmaceutical Care.
Seminar: Pharmaceutical care I.

8th week:
Lecture: GCP
Seminar: Pharmaceutical care II.

9th week:
Lecture: Evidence based medicine.
Seminar: Pharmaceutical care III.

10th week:
Lecture: Pharmacovigilance
Seminar: Pharmaceutical care IV.

11th week:
Lecture: Wound management
Seminar: Pharmaceutical care V.

12th week:
Lecture: Quality assurance in Health Care System

Seminar: On ward visiting I.

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

14th week:
Lecture: Pharmacoeconomy. Ethics. Cost-benefit, risk-benefit.
Seminar: On ward visiting III.

15th week:
Lecture: Consultation
Seminar: Consultation.

Department of Pharmaceutical Technology

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

1st week:
Lecture: Treatment of working atmospheres, Filtration of working atmospheres

2nd week:
Lecture: Iso-technology

3rd week:
Lecture: Dissolution, Lyophilization

4th week:
Lecture: Filtration of liquids, Sterilization

5th week:
Lecture: Solid Forms I., Mixing process

6th week:
Lecture: Solid Forms II: Conversion into dosage form.

7th week:
Lecture: Semi-Solid Forms I., Soft gelatin capsules

8th week:
Lecture: Packaging

9th week:
Lecture: Liquid Forms I., Content of liquid forms

10th week:
Lecture: Materials of containers for liquid forms

11th week:
Lecture: Liquid Forms II., Preparation of liquid forms

12th week:
Lecture: Filling of liquid forms, Design of production plants

13th week:
Lecture: Semi-Solid Forms II., Transdermal systems

14th week:
Lecture: Suppositories

15th week:
Lecture: consultation

Department of Pharmacology

Subject: **PHARMACOLOGY II. PRACTICE**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Practical: **60**

1st week:
Practical: Introduction to Pharmacology II.

2nd week:
Practical: Experimental demonstration I.

3rd week:
Practical: Experimental demonstration II.

4th week:
Practical: Experimental demonstration III.

5th week:
Practical: Experimental demonstration IV.

6th week:
Practical: Antihypertensive agents

7th week:
Practical: Hypothalamic and pituitary hormones. Diabetes mellitus and antidiabetic drugs. General characteristics of steroid hormones. Adrenocorticosteroids and adrenocortical antagonists.

8th week:
Practical: The gonadal hormones and inhibitors. Uterotonics, tocolytics. Agents that affect bone mineral homeostasis. Thyroid and antithyroid drugs.

9th week:
Practical: Drugs used in acid-peptic disease. Gastro-oesophagal reflux disease (GERD). Drugs promoting gastrointestinal motility. Antiemetic drugs. Laxatives. Antidiarrheal drugs.

10th week:
Practical: Drugs used in the treatment of chronic inflammatory bowel disease. Pancreatic enzyme replacement products. Pharmacology of the liver. Regulation of the appetite. Pharmacotherapy of obesity. Gerontopharmacology.

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

12th week:
Practical: Antifungal agents. Antiparasitic chemotherapy: basic principles. Antiprotozoal drugs. Anthelmintic drugs.

13th week:
Practical: Immunpharmacology

14th week:
Practical: Cancer chemotherapy

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

Requirements

During the semester students have to take two oral 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 avarage of the two mid-semester exams provides the grade of the Assessment of Workmanship (AW5) for the Pharmacology II. practice. Further correction of this grade is not an option.

Department of Pharmacology

Subject: **PHARMACOLOGY II. THEORY**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: Myocardial ischemia, antianginal drugs. Drugs used in heart failure.

2nd week:
Lecture: Agents used in cardiac arrhythmias

3rd week:
Lecture: Antihypertensive agents Agents used in hyperlipidemia

4th week:
Lecture: Bronchodilators and other agents used in asthma.

5th week:
Lecture: Diuretics and antidiuretics Drugs used in disorders of coagulation.

6th week:
Lecture: Introduction to the pharmacology of the endocrinology. Hypothalamic and pituitary hormones.

7th week:
Lecture: Diabetes mellitus and antidiabetic drugs. General characteristics of steroid hormones. Adrenocorticosteroids and adrenocortical antagonists.

8th week:
Lecture: The gonadal hormones and inhibitors. Uterotonics, tocolytics. Agents that affect bone mineral homeostasis. Thyroid and antithyroid drugs.

9th week:
Lecture: Introduction to the pharmacology of gastroenterology. Drugs used in acid-peptic disease. Gastro-oesophagal reflux disease (GERD). Drugs promoting gastrointestinal motility. Antiemetic drugs. Laxatives. Antidiarrheal drugs.

10th week:
Lecture: Drugs used in the treatment of chronic inflammatory bowel disease. Pancreatic enzyme

replacement products. Pharmacology of the liver.Regulation of the appetite. Pharmacotherapy of obesity. Gerontopharmacology.

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

12th week:
Lecture: Beta-lactam antibiotics. Chloramphenicol, tetracyclines, aminoglycosides. Macrolides. Quinolones. Antiviral chemotherapy and prophylaxis.

13th week:
Lecture: Immunpharmacology

14th week:
Lecture: Cancer chemotherapy

15th week:
Lecture: Toxicology

Requirements

During the semester students have to take two oral 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.

CHAPTER 19
ACADEMIC PROGRAM FOR THE 5TH YEAR

Department of Behavioural Sciences, Faculty of Public Health

Subject: **PHARMACEUTICAL PSYCHOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Becoming a patient.

2nd week:
Lecture: Pharmacist-patient encounter and its psychological characteristics.

3rd week:
Lecture: Patient in the pharmacy. Patient education.

4th week:
Lecture: The process of communication. The importance of nonverbal behaviour. Channels, messages and feed-back processes of face-to-face interpersonal interactions.

5th week:
Lecture: Emotions and their relation to health.

6th week:
Lecture: Empathy: its analysis, appearances,levels; its relation to burnout phenomena.

7th week:
Lecture: Person perception and its typical errors.

8th week:
Lecture: Control perception of health changes. Learned helplessness.

9th week:
Lecture: Coping with stress and illness. Stress management.

10th week:
Lecture: The role of personality in changes of health status. Type-A and type-C personality.

11th week:
Lecture: Chronic patients and diseases.

12th week:
Lecture: The stigmatized patient.

13th week:
Lecture: Pain: psychological and sociocultural aspects.

14th week:
Lecture: Psychological crisis: presuicidal syndrome.

15th week:
Lecture: The helper attitude and the burnout syndrome. Pharmacist caring.

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.

Department of Biopharmacy

Subject: **BIOPHARMACY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**
Practical: **30**

1st week:
Lecture: Fundamentals to biopharmacy.
Practical: Basic pharmacokinetic parameters.

2nd week:
Lecture: The LADMER system and its components.
Practical: Volume of Distribution, Clearance, Half-life.

3rd week:
Lecture: Liberation, absorption, distribution, metabolism, elimination, response.
Practical: One-compartment open model.

4th week:
Lecture: Drug release from the delivery system, bioavailability of the drug at the absorption site.
Practical: Continuous and intermittent drug delivery.

5th week:
Lecture: Drug clearance, hepatic drug elimination, renal drug elimination.
Practical: Equations, pharmacokinetic calculations.

6th week:
Lecture: Drug transport. Active and passive transport.
Practical: Equations, pharmacokinetic calculations II.

7th week:
Lecture: Type of drug delivery systems.
Practical: Equations, pharmacokinetic calculations III.

8th week:
Lecture: Biopharmacy of tables and capsules.
Practical: Equations, pharmacokinetic calculations IV.

9th week:
Lecture: Oral controlled release.
Practical: Equations, pharmacokinetic calculations V.

10th week:
Lecture: Delivering drugs by inhalation.
Practical: Equations, pharmacokinetic calculations VI.

11th week:
Lecture: Transdermal system.
Practical: Equations, pharmacokinetic calculations VII.

12th week:
Lecture: Time-programmed and patient-controlled drug delivey.
Practical: Equations, pharmacokinetic calculations VIII.

13th week:
Lecture: Smart drug delivery system and targeted therapy.
Practical: Equations, pharmacokinetic calculations IX.

14th week:
Lecture: Pharmaceutical biotechnology.
Practical: End of semester control test

Requirements

At least 30 % of the lectures must be visited. Students have to write end of semester control test. If the result of the test will not be at least 60%, the students will not be able to take oral exam .
Obsense of more than one practice is not allowed during the semester. The missed practice can be made up exclusively on the 14th week of the semester. Only students having adequately fulfilled the requirements of practice are allowed to get the signature and to take the final oral exam.

Department of Biopharmacy

Subject: **PHARMACEUTICAL CARE**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Pharmaceutical care (history, subject, theory, basic)

2nd week:
Lecture: Medication therapy management (subject, concept, theory)

3rd week:
Lecture: International pharmaceutical care protocols

4th week:
Lecture: Pharmaceutical care in Metabolic Syndrome

5th week:
Lecture: Diabetes prevention and pharm. care

6th week:
Lecture: Dyslipidemia and hypertension

7th week:
Lecture: Practice and theory of cholesterol, glucose, INR, and blood pressure measurement I.

8th week:
Lecture: Practice and theory of cholesterol, glucose, INR, and blood pressure measurement II.

9th week:
Lecture: Nutrition, diet and pharm. care I (theory, BMI, calculations, prevention, nutrition piramid)

10th week:
Lecture: Nutrition, diet and pharm. care II (special diet

and nutrition, special diet in metabolic syndrome and in oncology patients)

11th week:
Lecture: Pharmaceutical care and it's limitation (in cold, cough, flu, upper respiratory problems, fever, sunburn etc.)

12th week:
Lecture: Asthma, COPD and special inhalation medication.

13th week:
Lecture: Pharmaceutical care in reflux problems, heart burn, etc.

14th week:
Lecture: Pharm. care in hemostasis (coagulation, measurement etc.)

15th week:
Lecture: Consultation

Requirements

At least 30 % of the lectures must be visited. The missed lectures can be made up exclusively on the 14th week of the semester. Only students having adequately fulfilled the requirements are allowed to get the signature and to take the final exam.

Department of Pharmaceutical Chemistry

Subject: **QUALITY CONTROL**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Definition and history of quality management. Basics of quality policy. Definitions of Quality Assurance (QA) and Quality Control (QC).

2nd week:
Lecture: Elements of Total Quality Management (TQM). Key issues of establishing TQM. The Six Sigma concept. Construction of a Project Quality Plan.

3rd week:
Lecture: Quality in the manufacturing and marketing activity. The quality circle. Quality improvement tools and techniques. Quality systems: the history of development and basics of the ISO system of standards.

4th week:
Lecture: Relationship between the elements of quality management, QA, GMP and QC. The GXP system for drug production and distribution. Good Pharmacy Practice (GPP). Philosophy, elements and directives of GPP. Guidelines for GPP requirements in practice.

5th week:
Lecture: The role of the GXP system during the life cycle of medicines and drug-can-didates. The concept of Good Manufacturing Practice (GMP) requirements. Application of GMP: quality management.

6th week:
Lecture: Application of GMP: personnel aspects; premises and equipment.

7th week:
Lecture: Application of GMP: documentation.

8th week:
Lecture: Application of GMP: production, manufacturing.

9th week:
Lecture: Application of GMP: contract manufacture and analysis; complaints and recalls; self-inspection. Validation: basic concepts of Good Validation Practice (GVP).

10th week:
Lecture: Basics of Good Distribution Practice (GDP). Personnel aspects of quality management infrastructue: responsibilities of the key personnel (production leaders and quality managers). The phenomenon of Qualified Person (QP).

11th week:
Lecture: The cost of quality: failure costs, prevention costs, appraisal costs. Sterile drug production: GMP requirements, methods of sterilization.

12th week:
Lecture: Definition and elements of Good Laboratory Practice (GLP). Documentation of the laboratory examinations and experiences. Good Control Laboratory Practice (GCLP). Essentials of Good Clinical Practice (GCP). Quality assurance of GCP. ICH GCP guidelines.

13th week:
Lecture: Inspections and auditing. International

harmonization of inspections (PIC/S; ICH). WHO Guidelines for inspections.

14th week:
Lecture: The Drug Registration procedure. Approval by the EU Member State authorities (EMEA). The US Federal Food and Drug Administration (FDA): Office of Regulatory Affairs (ORA). FDA Center for Drug Evaluation and Research (CDER). FDA quality system regulations for drug approval.

15th week:
Lecture: Corruption and pharmaceuticals. Counterfeiting medicines. Hazard Analysis Critical Control Point (HACCP). Discussion of the topics of the lectures and questions emerging during the Semester. An occasional, on-demand written self-control test.

Requirements

Within the pharmaceutical industry, quality is the key issue that has to be addressed above all others. It is the reason that so many regulations, guidelines and controls are important and applied. The course "Quality assurance" deals with quality in its widest sense, reviewing the International Standards Organization (ISO) series of standards, generic instruments such as Total Quality Management (TQM) and industry-specific topics like Good Manufacturing Practice (GMP). The conduct of pre-clinical and clinical studies of drug-candidates is controlled by a variety of regulations and guidelines known collectively as Good Laboratory Practice (GLP) and Good Clinical Practice (GCP), respectively. The assurance of safety and efficacy of pharmaceuticals from the time they leave the factory to the point at which they are used by the patient is the concept of Good Distribution Practice (GDP) and Good Pharmacy Practice (GPP), which latter is also essentially obliged to take care of patients under physician-controlled- and self-medication.

Department of Pharmaceutical Technology

Subject: **DRUG INTERACTIONS THEORY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Introduction, definitions. Basic principles. Pharmacokinetic and pharmacodynamic interactions.

2nd week:
Lecture: Biotransformation, pharmacogenetics. Vaccination related interactions.

3rd week:
Lecture: Antithrombotic therapy and its interactions.

4th week:
Lecture: Cancer management and drug interactions.

5th week:
Lecture: Diabetes treatment and it's drug interactions. Contraceptives' interactions.

6th week:
Lecture: Possible interactions during antibiotic therapy.

7th week:
Lecture: The role of alcohol in interactions. CNS drugs and interactions 1.

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

9th week:
Lecture: NSAIDs- drug interactions.

10th week:
Lecture: Interactions with sympathomimetics and antiasthmatics.

11th week:
Lecture: Cardiovascular drug interactions I.

12th week:
Lecture: Cardiovascular drug interactions II.

13th week:
Lecture: Consultation.

14th week:
Lecture: Consultation.

15th week:
Lecture: Consultation.

Department of Pharmaceutical Technology

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

Division of Clinical Pharmacology

Subject: **CLINICAL PHARMACOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Basic principles of Clinical Pharmacology.

2nd week:
Lecture: Ethical and legal aspects.

3rd week:
Lecture: The study phases (I-II).

4th week:
Lecture: The study phases (III-IV).

5th week:
Lecture: The clinical trial protocol.

6th week:
Lecture: The GCP requirements in Clinical Pharmacology.

7th week:
Lecture: Study Report (Clinical, Final).

8th week:
Lecture: Statistical methods in Clinical Pharmacology.

9th week:
Lecture: Quality Assurance in Clinical Pharmacology.

10th week:
Lecture: Adverse events, serious adverse events, side effect.

11th week:
Lecture: Patient Information and Informed Consent.

12th week:
Lecture: Practical experience in an ongoing study.

13th week:
Lecture: Visit of a pharmaceutical company.

Requirements

The aim of this course is to introduce the students into a rapidly developing and evolving subject. Clinical Pharmacology is not merely a link between Pharmacology and Clinical Medicine. The objective is to enhance the understanding of how drugs act and may be best used in the clinic, how compounds are transformed into drugs, how clinical trials are conducted.
Requirements of admission: after 4 years of pharmaceutical or medical studies
Speakers:
Miklós Bodor, M.D.,Ph.D., Associate Professor, Head of the Division of Clinical Pharmacology
Péter Kovács, M.D.,Ph.D.,Dsc, Professor in Pharmacology
Sándor Somodi, M.D.,Ph.D., Assistant Professor

Required infrastructure: lecture hall, library
Examination: oral and written
Literature: special papers and handbooks will be provided

Division of Environmental Physics of University of Debrecen and ATOMKI

Subject: **RADIOPHARMACY THEORY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: Radionuclides and radioactive tracking in the living organs - nuclear medicine.

2nd week:
Lecture: Radiation properties of radionuclides for diagnosis and therapy. Dosimetry.

3rd week:
Lecture: In vivo radioisotope diagnostics in humans.

4th week:
Lecture: Radionuclide therapy as human treatment.

5th week:
Lecture: General methods of radioisotope manufacturing.

6th week:
Lecture: Radionuclide genarators and applications.

7th week:
Lecture: Preparation of radiopharmaceuticals used in nuclear medicine, quality assurence, GMP

8th week:
Lecture: Advantage and disadvantages of radiopharmaceutical kit formulation. The Nuclear Pharmacy concept.

9th week:
Lecture: Preparation and use of radiopharmaceuticals with positron emitters (F-18, C-11, N-13, O-15).

10th week:
Lecture: Radioactive noble gases (Kr-81m, Xe-133) and I-123 as well as I-131 labelled radiopharmaceuticals.

11th week:
Lecture: Anionic Tc-99m complexes for renal, bone and hepatobiliar investigations.

12th week:
Lecture: Neutral and cationic Tc-99m complexes; brain and heart imaging.

13th week:
Lecture: Preparation and use of Tc-99m labelled macromolecules and radiocolloids; blood cell labelling.

14th week:
Lecture: Other radioactive metals in diagnostic radiopharmaceuticals (Cr-51, Ga-67, In-111, T1-201).

15th week:
Lecture: Therapeutic radiopharmaceuticals containing P-32, Y-90, I-131, Sm-153, Re-186 and Re-188 radionuclides.

Requirements

Radioactive tracing under in vivo conditions. Principles of diagnostic imaging and radionuclide therapy. Types of physiological and biochemical processes to be traced with radioactive methods: macroscopic flow systems (blood, liquor and lymphatic circulation), selective localization (absorption), metabolism and excretion.

Radioactive tracers: types of radiations, radioisotope preparations, decay rows, generator systems, GMP productions. The Mo-99/Tc-99m generator and other generators.
Tc-99m radiopharmaceuticals: cationic, neutral and anionic complexes as well as colloids. Technetium labelling techniques. Ga-67/68, In-111 and Tl-201 radiopharamceuticals. PET radiopharmaceuticals: C-11, N-13, O-15, F-18 compounds. Radiopharmaceuticals containing radioiodine (I-123, I-131). Therapeutic radiopharmaceuticals.

(See also reading material, Gopal B. Saha: Fundamentals of Nuclear Pharmacy, Springer 2010, sixth edition)

Division of Environmental Physics of University of Debrecen and ATOMKI

Subject: **RADIOPHYARMACY PRACTICE**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **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.

CHAPTER 20
REQUIRED ELECTIVE COURSES

Department of Biochemistry and Molecular Biology

Subject: **MOLECULAR MECHANISM OF DISEASES CONCERNING GREAT POPULATIONS**
Year, Semester: 3rd year/1st semester
Number of teaching hours:
Lecture: **25**

1st week:
Lecture: Introduction to molecular medicine

2nd week:
Lecture: Genomic medicine

3rd week:
Lecture: Diabetes

4th week:
Lecture: Obesity

5th week:
Lecture: Vitamin D and immundefects

6th week:
Lecture: Cancer I.

7th week:
Lecture: Cancer II.

8th week:
Lecture: Cancer II.

9th week:
Lecture: Osteoporosis

10th week:
Lecture: Immunedeficiencies

Requirements

Attendance on the lectures is compulsory.

Department of Biophysics and Cell Biology

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

1st week:
Practical: Exemption Tests.

2nd week:
Practical: Exemption Tests.

3rd week:
Practical: Word processor programs, MS Word I.1. File: save, save as, print, new document, open2. Editing text 1: input letters, cursor, copy, paste, paste special, cut, move, clipboard, undo, redo3. Editing text 2: selecting text, mouse, keyboard, shift, control, home, end, pgup, pgdown4. Home 1: formatting font, font size, font color, typeface, bold, italic, underline, highlighting, super/subscript, customize menu5. Home 2: formatting paragraph, line spacing, indentation (left, right, first line, hanging), alignment (Tabs: left, center)6. Home 3: bulleted, numbered list, searching text, find, replace, select all7. Insert: tables, inserting pictures, shapes, page numbers, header, footer, page break, symbols, (text box)8. Page layout: margins, orientation, size, manual setting of margins , columns, line numbers, watermark, page color, page borders

4th week:
Practical: Word processor programs, MS Word II.

5th week:
Practical: Spreadsheets programs, MS Excel I.1. Entering data (difference b/w text & numbers), autofill series (numbers, days, months, etc.), adjusting column width2. 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 reference4. Using functions, statistical functions: average, stdev, count, sqrt, countif, if, calculating SEM, etc.5. Creating charts: bar chart, scatter plot, error bars, labels6. Formatting charts: colors, symbols, axis scaling, chart title, axis title7.

Data sorting by one or more criteria, filters8. (Statistical tests (F-test (equal variance test), t-test assuming equal/unequal variances))

6th week:
Practical: Spreadsheets programs, MS Excel II.

7th week:
Practical: Spreadsheets programs, MS Excel III.

8th week:
Practical: Spreadsheets programs, MS Excel IV.

9th week:
Practical: Computerised presentation, MS PowerPoint.1. Entering text, inserting figures / drawing objects2. Editing: selecting multiple objects, resizing, rotating, copy, paste, move, undo, redo3. Colors: background (templates), line, fill4. Alignment, grouping, order (front/back), arranging objects (distribute horiz. / vert.)5. Slide sorter, slide show6. Slide transitions, animations

10th week:
Practical: Fundamentals and basic concepts of informatics.

11th week:
Practical: Logical and physical realization of networks.

12th week:
Practical: Internet.

13th week:
Practical: Summary.

14th week:
Practical: Test I.

15th week:
Practical: Test II.

Requirements

The acquisition of fundamental theoretical and practical knowledge from the function of the modern personal computers.Course description: PC architecture, operating systems, file management, network knowledge,internet and its opportunities of application, word processor, spreadsheet, the usage of presentational programs, the achievement of scientific databases and its use. Without registration, there is no way to do the course! First year students who missed/skipped the exemption test, but signed up for the course in the Neptun must attend the course and do the final test at the end. For students attending the informatics course a maximum of 4 absences are allowed during the semester to receive a signature (we recommend to use as few as possible, in case an emergency comes up). This is taken very seriously! Missing more than 4 classes automatically means losing the chance to pass the course. There will be a final test at the end of the semester. For students attending the informatics course a maximum of 4 absences are allowed during the semester (we recommend to use as few as possible, in case an emergency comes up). This is taken very seriously! Missing more than 4 classes automatically means refused signature therefore losing the chance to pass the course. Every student allowed to make up the missed practicals with another group but only on the given week, if there are enough free seats in the room. For students attending the informatics course a maximum of 4 absences are allowed during the semester to receive a signature (we recommend to use as few as possible, in case an emergency comes up). This is taken very seriously! Missing more than 4 classes automatically means losing the chance to pass the course. There will be a final test at the end of the semester. Every student is allowed to make up the missed practicals with another group but only on the given week, if there are enough free seats in the room. The course start with an exepmtion test. Only first year students allowed to write the exemption test at the first week of the given semester with their group (appointment sholud be checked in the given timetable). In any other cases (students older than first year/repeaters/students who are not exepmted) 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 exepmtion and the final tests covers topics and skills in connection with Microsoft office Word, Excel, and PowerPoint (versions:2007/2010) programs, as wirtten in the curriculum. Both of the tests (exemption and the final test) are written tests. The tests are practical tests, conducted in the computer room. Students passing the exemption test will automatically receive 5 (excellent) grade at the end of the semester. Final grades based on the final test score will be given according to the following table: 61% = garde 1 (fail) 61%-70% = grade 2 (pass) 71% - 80% = grade 3 (satisfactory) 81% - 90% = grade 4 (good) 91% = garde 5 (excellent) Students should download free Office guide books from the following link. (Email registration is required for downloading files). Students who did not get exemption/did not show up at the exemption test/repeaters/students older than first year MUST ATTEND on the course. They should join to one of the groups mentioned in the timetable. The number of the seats is limited in the classroom. Students who has informatics course in the given appointment (according to the timetable) have priority to attend the lesson. Others are allowed to join to the given group if there are more free seats. Older students have to do the whole course as well. Students passing the exemption test will automatically receive 5 (excellent) grade at the end of the semester. Students who failed the exemption test must attend the course and do the final test at the end. Students having ECDL (European Computer Driving Licence) are not required to write the exemption test, instead, they can submit exemption request to the Education Office. Until You are waiting for the decisions, You should also come to the course!!!

Department of Biophysics and Cell Biology

Subject: **MODERN BIOPHYSICAL METHODS IN BIOLOGY AND MEDICINE**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **24**

3rd week:
Lecture: 1-3. Luminescence spectroscopy. Theoretical background and principles of application of fluorescence spectroscopy to study the structure of proteins, nucleic acids and that of the cell membrane. Fluorescence conjugation of biomolecules, techniques based on fluorescence polarization and fluorescence resonance energy transfer.

4th week:
Lecture: 4-6. Modern microscopic methods for structural and functional characterization of cells. Theoretical background of fluorescence microscopy and image processing. Generation of scanning and wide-field images. Detectors, analog/digital conversion and digital storage of images. Digital image analysis: principles and biological applications. Principles of confocal microscopy. High resolution non-linear optical microscopy.

5th week:
Lecture: 7-9. LSC - Laser-Scanning Cytometry (imaging cytometry, slide-based imaging cytometry). Limitations of the flow cytometry and microscopy. Comparing flow cytometry, confocal microscopy and laser-scanning cytometry. How does laser-scanning cytometry work? Strength and limitations of the laser-scanning cytometry. Laser scanning-cytometry in cell biology and clinical research.

6th week:
Lecture: 10-12. Structure of the cell membrane, functional consequences of the mobility (lateral and rotational movement) of proteins in the membrane. Novel models for the structure of the cell membrane, lipid domains. Time-dependent fluorescence and phosphorescence spectroscopy, fluorescence recovery after photobleaching (FRAP), fluorescence correlation spectroscopy.

7th week:
Lecture: 13-15. 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).

8th week:
Lecture: 16-18. Modern electrophysiological techniques. Passive and active electrical properties of the cell membrane, structure and function of ion channels. Principles and application of the patch clamp technique: recording ionic currents and membrane potential.

9th week:
Lecture: 19-21. Medical applications of NMR and MRI.

10th week:
Lecture: Test

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 (see on the website of the Department of Biophysics and Cell Biology)!
Type of examination: practical grade, 5 levels
Scoring:

below 50%:	fail
51%-59%:	pass
60-69 % :	satisfactory
70-85 %:	good
above 85%	excellent

Examination: Written test. The exam is during the 8th lecture.

Repeated/improved exam: during the examination period.

Department of Pharmaceutical Chemistry

Subject: **CHEMICAL BIOLOGY**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: Structure of proteins and polysaccharides.

2nd week:
Lecture: Structure of nucleic acids

3rd week:
Lecture: Structure of macromolecular lipides. Interactions determinating the structure of macrolecules.

4th week:
Lecture: Chemical synthesis of peptides and proteines.

5th week:
Lecture: Chemical synthesis of polysaccharides.

6th week:
Lecture: Chemical synthesis of nucleic acids

7th week:
Lecture: Molecular biology as a tool of chemical biology.

8th week:
Lecture: Methodologies of molecular biology

9th week:
Lecture: Electron spectroscopy and vibrational spectroscopy in chemical biology

10th week:
Lecture: Basics of NMR spectroscopy

11th week:
Lecture: X-ray diffraction. Theoretical calculations in chemical biology.

12th week:
Lecture: The molecular recognition.

13th week:
Lecture: Mass spectrometry in chemical biology.

14th week:
Lecture: Case studies of chemical biology.

15th week:
Lecture: Case studies of chemical biology.

Requirements

The aime 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.

Department of Pharmaceutical Surveillance and Economics

Subject: **PHARMACOVIGLIANCE**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **15**

1st week:
Lecture: The concept and basic definitions in Pharmacovigilance. The tools and guidelines for agencies and for international cooperation.

2nd week:
Lecture: The basics of Drug safety and Benefits/risk evaluation. Signal detection.

3rd week:
Lecture: The process of safety reporting. Roles, responsibilities and participants of the national and EU pharmacovigilance systems. The effects of GPP on public health and economy.

4th week:
Lecture: Classification of side effects, adverse drug reactions. Drug and food interactions.

5th week:
Lecture: Pharmacovigilance during drug development process. Postmarketing drug safety: tools and methodology.Pharmacovigilance during drug development process. Postmarketing drug safety: tools and methodology.Pharmacovigilance during drug development process. Postmarketing drug safety: tools and methodology.

Department of Pharmaceutical Technology

Subject: **BIOCOSMETICS**
Year, Semester: 4th year/2nd 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

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

1st week:
Lecture: Hungarian civil law I.

2nd week:
Lecture: Hungarian civil law II.

3rd week:
Lecture: Hungarian civil law III.

4th week:
Lecture: Hungarian civil law IV.

5th week:
Lecture: Ownership

6th week:
Lecture: Joint ownership

7th week:
Lecture: Collective ownership

8th week:
Lecture: Criminal law I.

9th week:
Lecture: Criminal law II.

10th week:
Lecture: Criminal law III.

11th week:
Lecture: Criminal law IV.

12th week:
Lecture: individual proprietorship

15th week:
Lecture: consultation

Subject: **OPERATING SYSTEM OF THE PHARMACEUTICAL INDUSTRY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **15**

Subject: **PHARMACEUTICAL COMPUTER ADMINISTRATION**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Computer knowledge.

2nd week:
Lecture: Computer programs I.

3rd week:
Lecture: Computer programs II.

4th week:
Lecture: Computer programs in pharmacy I.

5th week:
Lecture: Computer programs in pharmacy II.

6th week:
Lecture: Computer programs in pharmacy III.

7th week:
Lecture: Computer programs in pharmacy IV.

8th week:
Lecture: Exam

9th week:
Lecture: Ordering program on computer (in pharmacy) I.

10th week:
Lecture: Ordering program on computer (in pharmacy) II.

11th week:
Lecture: Ordering program on computer (in pharmacy) III.

12th week:
Lecture: Administration on computer I.

13th week:
Lecture: Administration on computer II.

14th week:
Lecture: Consultation.

15th week:
Lecture: Exam

Subject: **SPECIAL TRAINING COURSE - CLINICAL PHARMACOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

Subject: **SPECIAL TRAINING COURSE - INDUSTRIAL PHARMACEUTICAL TECHNOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

Subject: **SPECIAL TRAINING COURSE - SYNTHETIC CHEMICAL**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

Subject: **SPECIAL TRAINING COURSE - TOXICOLOGY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **60**

1st week:
Lecture: 1. Introduce pharmacy rooms. Division of pharmacy, instruments, equipments.2. Storage of drug preparations, requirements. chemical substances, drugs, galenicals, registered preparations, drugs with strong effect, Study those chemicals studied at the University, materials knowledge, nomenclature3. Reading of Prescriptions, pharmaceutical Latin.

2nd week:
Lecture: 4. Instruments used in Pharmacy, pharmacy balances, small equipments etc. description, cleaning, maintenance.5. Requirements for packaging of pharmaceutical preparations. Choosing the suitable containers. Packaging materials. Glass, plastic containers, closures. Signatures.

3rd week:
Lecture: 6. Simple processes of pharmaceutical technology (measuring, sieving, mixing of powders, dilution, concentration calculation of solutions, other simple calculations needed for parmaceutical work.7. Technical books of pharmacy. (H.Ph. VII., H.Ph.VIII., Eur. Ph. 7., FoNoVII.)

4th week:
Lecture: 8. Tests, investigations according to the Eur. Ph. 7.9. Connection with patients. Take part in parmacy 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 pahrmacists. 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.

Subject: **STATE EXAM PRACTICE I. PRESCRIPTION PHARMACY**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Practical: **120**

Subject: **STATE EXAM PRACTICE II. INSTITUTIONAL PHARMACY OR GALENIC LABORATORY**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **120**

Subject: **STATE EXAM PRACTICE II. MANAGEMENT**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **120**

Subject: **STATE EXAM PRACTICE II. PHARMACY DISPENSING**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **120**

Subject: **STATE EXAM PRACTICE II. PRESCRIPTION PHARMACY**
Year, Semester: 5th year/2nd semester
Number of teaching hours:
Practical: **120**

1st week:
Lecture: Technical books of pharmacy. (H.Ph. VII., H.Ph.VIII., Eur. Ph. 7., FoNoVII.)

2nd week:
Lecture: Nomenclature,

3rd week:
Lecture: reading of prescriptions

4th week:
Lecture: materials knowledge

5th week:
Lecture: calculations

6th week:
Lecture: computer program.

7th week:
Lecture: Theoretical and practical knowledge of registered drug preparations

8th week:
Lecture: Basic knowledge of pharmacy management, pharmaceutical affairs organizations and juristic knowledge for pahrmacists.

9th week:
Lecture: Pharmacy organizations.

10th week:
Lecture: The basic knowledge of medical aid products, equipments and machines for pharmaceutical preparations.

11th week:
Lecture: the theoretical and practical knowledge of vaccines, immunosera, and sutures for human and veterinary use.

12th week:
Lecture: Consultation

13th week:
Lecture: The students need to practice the medium scale pharmaceutical technology operations.

14th week:
Lecture: Equipments and machines for medium scale pharmaceutical technology operations.

15th week:
Lecture: Students might learn the process of special pharmaceutical dosage forms for inpatients. (e.g.: infusions, injections, individual compositions).

16th week:
Lecture: Consultation

Subject: **THESIS**
Year, Semester: 5th year/2nd semester
Number of teaching hours:

Subject: **THESIS CONSULTATION**
Year, Semester: 5th year/1st semester
Number of teaching hours:

Subject: **VETERINARY HYGIENE**
Year, Semester: 5th year/1st semester
Number of teaching hours:
Lecture: **30**

1st week:
Lecture: Basics of veterinary hygiene I.

2nd week:
Lecture: Basics of veterinary hygiene II.

3rd week:
Lecture: Basics of veterinary hygiene III.

4th week:
Lecture: Basics of veterinary hygiene IV.

5th week:
Lecture: Formule Normales Veterinariae III

6th week:
Lecture: Preparations from Formule Normales Veterinariae III

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

10th week:
Lecture: Veterinary illness and therapy II.

11th week:
Lecture: Veterinary illness and therapy III.

12th week:
Lecture: Test

13th week:
Lecture: Zoonisis-animal diseases transmissible to humans

14th week:
Lecture: Zoonisis-animal diseases transmissible to humans II.

15th week:
Lecture: Consultation

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 Physiology

Subject: **MODERN TECHNIQUES ALLOWING THE INVESTIGATION OF PHYSIOLOGICAL PHENOMENA**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **20**

1st week:
Lecture: The lectures are listed at the web site of the Department of Physiology (http://phys.dote.hu)

Requirements

1. Signature of Lecture Book Lecture attendance may be followed up by the Department. The lecture will not be delivered if 5 or fewer students show up. Nevertheless, the lecture material is going to be asked in the final assessment. The lectures of the credit course are listed at the web site of the Department of Physiology (http://phys.dote.hu) 2. Evaluation during the semester None. 3. Examination At the end of the course a written final assessment will be organized 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 There will be no remedial test or any other way to improve the final score.

Department of Physiology

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

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). Guidelines for the format of Problem Based Learning Report Students should review carefully this guide and Problem Based Learning Reports (PBLR) must be prepared accordingly. PBLR should be submitted via E-mail in PDF format; no other format is accepted. The length of PBLR should be between 10-30 pages including all sessions listed below. Appendix or supplementary material, all together no longer than 20 pages, containing data or methodological information can be attached to the manuscript if it is necessary. Easy reading of the text should be considered as primary importance when choosing typeface and font size. Instead of pursuing artistic view, the format of the text should serve the content. Page numbering starts on front page (can be hidden); footnotes and page headings should be used sparingly. The text should be written in good English/American, but prevent using the mixtures of these. Use your text editor to eliminate possible grammatical or spelling errors. Use standard abbreviations where possible, and always give definition at first use. Using nomenclature and units follow internationally accepted rules and conventions; prefer units used in medical practice where possible and the international system of units (SI). Ensure that each table and figure is numbered and has a caption. A caption should have a brief title and short description of the illustration with a compact conclusion. Select different type face for captions. Required elements of the PBLR: Front Page Table of contents Abstract Introduction Methods Results Discussion References Further elements like preface, list of abbreviations, acknowledgements, and conclusions are optional. All sections should begin on new page, headings typographically separated from the text, centered between left and right margins. Requirements for the sessions: - Front page should contain the followings (template is available at the course coordinator). - the full name of the department on the top of the page - the full title of the manuscript - a subtitle: 'PBL Project' - name of the author(s) with class and group numbers - name of the tutor - date when project was closed - Table of contents should be accurate and detailed referring to sub sessions if used in the manuscript. - Abstract should be no longer than one page including headings summarizing the aim(s), chosen methods, the most important data and conclusions. Short summary of motivation is welcomed but not required. References, not common abbreviations should be avoided. - Introduction cannot be longer than the half of the text. State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results. - Methods should be detailed to the extent to allow the work to be reproduced. Flow-charts, diagrams or photographs to demonstrate critical methodological steps or simplify long descriptions are welcomed. - Results should be clear and concise. Raw data can be used only as representative recordings or examples if necessary, appropriate use of statistical methods is critical when presenting results. - Discussion is not recapitulation of results but exploration of the significance of the work. All conclusions should be drawn from the presented results. Supporting data from literature can be used but extensive citations or discussion of the literature should be avoided. Attempts to resolve contradiction between your own data or your data and the literature

is greeted. - References should be numbered and listed alphabetically by the name of the first author, or the title of the website when using web reference. When using web reference the full URL should be provided. Cite references in the manuscript by numbers. Evaluation of PBLR PBLRs are sent for evaluation to reviewers (professors of Dept. of Physiology) selected by the course coordinator. The reviewers evaluate the manuscripts on a five grade scale according to the following criteria. - Excellent: well-conducted and well-presented study. All deficiencies are counterbalanced by positive qualities. Minimal stylistic errors or conflict with the format requirements. Original idea, concept or design can compensate weakness in format. - Good: PBLR meets format requirements, but has some weakness either in introduction or discussion but results session is solid, or displays stylistic or typographical errors. - Satisfactory: PBLR meets format requirements, but both introduction and discussion carries weakness (results must be solid). Numerous stylistic or typographical errors without influencing the readability of the text. Satisfactory is given if illustrations are not clear, graphically not well presented or hard to understand the message. Any mismatch between text and illustration results also satisfactory. - Pass: PBLR meets format requirements and the concept of the study is clear. Selected method is appropriate but the manuscript has several substantial flaws in the analysis or the write-up. Inappropriate statistical method, insufficient data or numerous stylistic, typographical errors in text or graphical errors in illustrations results pass too. - Fail: conflict with format requirements, major flaws in execution or presentation. A fail should also be given if the manuscript reveals a fundamental lack of understanding of the concept presented or the stylistic/grammatical/graphical errors have severe impact on the readability of the text. Missing the deadline result fail with no regard to the content or format of the manuscript.

Department of Physiology

Subject: **THE REGULATORY ROLE OF THE CELL MEMBRANE IN PHYSIOLOGICAL AND PATHOLOGICAL CONDITIONS**
Year, Semester: 2nd year/2nd semester
Number of teaching hours:
Lecture: **20**

1st week:
Lecture: The lectures are listed at the web site of the Department of Physiology (http://phys.dote.hu)

Requirements

1. Signature of Lecture Book Attendance at lectures is suggested. Lecture attendance may be registered 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 frame of the final assessment. The lectures of credit course are listed at the web site of the Department of Physiology (http://phys.dote.hu) 2. Evaluation during the semester None 3. Examination At the end of the course a written final assessment will be organized, using test (multiple choice) questions. If somebody missed the test or want to improve his/her results, an extra test will be provided on the first week of the exam period. There is no further possibility to get mark, if somebody miss both possibilities his/her mark will be Failed. The result of the assessment will determine the verification mark of the credit course using the following conversion table: 0-39.9% - Failed 40-54.9 - Pass 55-69.9% - Satisfactory 70-84.9 - Good 85-100% - Excellent

Division of Applied Chemistry

Subject: **PHARMACEUTICAL EXCIPIENTS**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **15**

1st week:
Seminar: Basic standards of SI. Prefixes. Measurements in pharmacy.

2nd week:
Seminar: Basic chemical calculations.

3rd week:
Seminar: Introduction to Polymer Chemistry.

4th week:
Seminar: Polymeric excipients, general characterization..

5th week:
Seminar: General view of a medicine. Active ingredients, excipients, contaminants.

6th week:
Seminar: Consultation, problem solving

7th week:
Seminar: mid term test

8th week:
Seminar: Controlled drug release.

9th week:
Seminar: Fillers, solvents, emulsifiers.

10th week:
Seminar: Antioxidants, preservatives.

11th week:
Seminar: Aerosol propellants, colorants.

12th week:
Seminar: Materials for packaging.

13th week:
Seminar: Incompatibility.

14th week:
Seminar: Consultation, problem solving.

15th week:
Seminar: end-term test

Requirements

The presence of students at the seminar is obligatory and will be recorded. If the student is absent from more than 4 seminars, the semester will not be accepted Evaluation is based on exam performance: mid-course and end-course written exams (50-50 %). Detailed information will be given in the first lecture.

Division of Emergency Medicine

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

1st week:
Lecture: Definition of "first aid"; first aid levels; time factor; behavior of first responder in the field; the emergency call

2nd week:
Lecture: Unconsciousness; airway obstruction; airway opening maneuvers.

3rd week:
Lecture: Death as a process; determining of clinical death; the different oxygen demand of the brain depending on age; establishing unconsciousness or death; assessment of vital signs; assessment of breathing, circulation, pupils and muscle tone

4th week:
Lecture: Reanimation on the spot – organization problems; the theory of CPR; complications during the CPR; effect, results and success during CPR

5th week:
Lecture: Examination of breathing and circulation; the chest-thrust; airway opening maneuvers; the recovery position (Gábor maneuver); one hour

6th week:
Practical: Practicing the ventilation (one hour)

7th week:
Practical: Practicing the chest compression (one hour)

8th week:
Practical: CPR training without equipment (two hours)

9th week:
Practical: CPR training, two-rescuer method (two hours)

10th week:
Practical: Bleeding control with direct pressure and pressure point techniques; bandages and fixation; equipments, tools and maneuvers; general rules of provisory injury therapy; pressure bandage for controlling of arterial and venous bleeding on the spot (two hours)

11th week:
Practical: Bandages for head, nose; ears, eyes; chin, body and extremities; practicing the bandages (two hours)

12th week:
Practical: First aid in fractures, luxations, distortions and extended soft-tissue injuries; bandage for fixation with

special triangle; Schantz collar; stifneck; Dessault bandage; fixation of finger and hand fractures; usage of Kramer splint and pneumatic splint (two hours)

13th week:
Practical: CPR training (two hours)
Self Control Test

14th week:
Lecture: Burning; first aid in burning diseases; shock

15th week:
Lecture: Intoxication; guideline of poisoning in toxicology; typical intoxications, special signs, first aid

Requirements

Condition of signing the Lecture book:
Attendance at practices is compulsory. The tutor may refuse to sign the Lecture book if the student is absent from the practices more than twice in a semester. Missed practices should be made up for after consultation with the practice tutor. Facilities for a maximum of 2 make-up practices are available at the Ambulance Station in Debrecen. The current knowledge of students will be tested two times in each semester in written test.

Division of Operative Techniques and Surgical Research

Subject: **BASIC KNOWLEDGE OF MEDICAL TOOLS AND SURGICAL BIOMATERIALS FOR PHARMACOTHERAPEUTICAL SURGICAL CARE**
Year, Semester: 4th year/2nd semester
Number of teaching hours:
Lecture: **8**
Seminar: **16**
Practical: **8**

1st week:
Lecture: General and surgical deontology. Surgical armamentarium
Seminar: Cutting, hemostatic, grasping-retracting, special and suturing instruments. Order of the instrumental trays and tables. Handling and sterilization of the instruments.

2nd week:
Lecture: Wound closure and the required surgical biomaterials.
Seminar: Classification, package, application fields, storage, sterilization and quality control of suture materials.
Practical: Surgical needles, suture materials, knotting and suturing techniques.

3rd week:
Lecture: Operating room environment, order of the operating work. Scrubbing and the required materials. Preparations for the operation, isolation of the operative field.
Seminar: Instrumental order on the operative tables. Disinfection and isolation of the operative field.
Practical: Scrubbing. Wound closure with different suturing techniques on surgical training models.

4th week:
Lecture: Hemostasis. Methods and the required materials. Injection techniques and blood sampling. Punction, preparation and cannulation of vessels.
Seminar: Basics of hemorheology.
Practical: Ligation of vessels on gauze models. Vein preparation/cannulation, injection techniques (i.m., i.v.) and taking blood samples on phantom models.

5th week:
Lecture: Fluid substitution. Infusion solutions and their application. Blood preparations. Enteral and parenteral nutrition. Nutrition and care of frail patients.
Seminar: Different types of infusion accessories. Demonstration of the infusion pump. Preparing mixture infusion, calorie calculation.
Practical: Preparing the infusion set and connecting it to the venous catheter. Different types and use of blood pressure gauge.

6th week:
Lecture: Surgical incisions and laparotomies. Endoscopic techniques. Basic principals of intestinal surgery.
Seminar: Video-demonstration of laparotomies. Wound types. Principles of wound care. Wound dressings. Definition, types and application of catheters and drains. Catheterization of urinary bladder. Incontinence and its treatment. Urine condoms. Types and handling of stoma bags.

7th week:
Lecture: Insight into the surgery of the parenchymal organs. Bioplasts and tissue adhesives and their application field. Conicotomy, tracheostomy. Basic principles of vascular surgery.
Seminar: Application of tissue adhesives and bioplasts. Conicotomy and tracheostomy. Reconstruction of blood vessel and the required biomaterials (video demonstration).

8th week:
Lecture: Ethical issues for animal research. Animal care, ethical problems, permissions. Keeping and treatment of experimental and laboratory small animals (mouse, rat). Narcosis and anesthesia of experimental animals. Intraoperative monitoring, registration of various parameters.

Seminar: Requirements of ISO, GLP. Preclinical experiments in pharmacology. Technique of dissection of isolated organs (heart, vessel, muscle, bowel preparates). In vivo techniques and models. Extermination, autopsy and taking samples of experimental animals.
Self Control Test

Requirements

Prerequisite: Pharmaceutical technology IV. theory and practice
Aim of the subject
The main aim is to acquire up-to-date theoretical and practical knowledge that is appropriate to the modern age and the students can get acquainted with the basic methods, that can help the pharmacists to be familiar with the basic surgical interventions and the required materials during their work. The students have to learn the characteristics and the means of application of the biomaterials (suturing materials, bioplasts, tissue adhesives, catheters, drains, stoma bags, urine condoms, incontinence pads) that can be used during the surgical practice. They should have the knowledge of the manual interventions that they may need during pharmacological experimental work. A further aim is to improve their 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 two seminars/practices in a semester (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.

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

Subject: **POLYMORPHISM OF PHARMACEUTICALS**
Year, Semester: 3rd year/2nd semester
Number of teaching hours:
Lecture: **28**

1st week:
Lecture: Introduction. Polymorphism, definition. Polymorphism in everyday life and pharmaceutical industry. Analytical methods. Ritonavir and cefuroxime.

2nd week:
Lecture: Thermodynamics. Basics of thermoanalytical methods and their application in polymorph research. Monotrope and enantiotrope systems.

3rd week:
Lecture: Patent literature basics. Claims. Polymorphs in the patents. Ranitidine hydrochloride and paroxetine hydrochloride.

4th week:
Lecture: Thermodynamics and kinetics of crystallization. Controlling polymorph composition. The Aspartame case.

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

6th week:
Lecture: Basics of X-ray diffraction. Powder diffraction methods. Quantitative XRPD.

7th week:
Lecture: Single crystal X-ray diffraction. Structure of polymorphs. The hydrogen bond.

8th week:
Lecture: Ab initio structure determination from powder diffraction data. Indexing, - Rietveld refinement.

9th week:
Lecture: Solid state NMR basics. ssNMR in polymorph research.

10th week:
Lecture: FT-IR and Raman spectroscopy and microscopy. ATR techniques.

11th week:
Lecture: Polymorphism - quality control issues

12th week:
Lecture: Polymorphism of dyes and explosives.

13th week:
Lecture: Crystallographic databases. CSD, polymorph structures in the Database.

14th week:
Lecture: Regulatory questions of polymorphism. FDA, ICH, EMEA rules, Q6A.

15th week:
Lecture: Conclusion. Case studies. Polymorphism of chocolate.

Requirements

Entrance conditions: successful final exam on Pharmaceutical technology II., at least 5 students

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 MedicineSynopsis of information retrieval

5th week:
Practical: Test

Requirements

Class attendance!

CHAPTER 21
TITLES OF THESES

Department of Anatomy, Histology and Embryology

1. Title: Inhibition mediated by GABAA and GABAB receptors in the superficial spinal dorsal horn in health and disease
2. Title: Molecular organization of the endogenous cannabinoid signaling apparatus in the superficial spinal dorsal horn in health and disease
Tutor: Miklós Antal M.D., Ph.D., D.Sc.

3. Title: Investigation of vestibular plasticity in the frog
4. Title: Role of the extracellular matrix in the plasticity of the vestibular system.
5. Title: Termination of the vestibulospinal tract in the rat
Tutor: Klára Matesz M.D.,Ph.D.,D.Sc.

6. Title: Dendritic impulse propagation in mice showing symptoms of Alzheimer's disease – computer modelling
Tutor: Ervin Wolf M.Sc., Ph.D.

7. Title: Dendritic integration of inhibitory and excitatoty cortico-cortical inputsin the primary visual cortex
8. Title: Functional mapping of callosal inputs on the dendritic arbour of neurons in the visual cortex
Tutor: Zoltán Kisvárday M.Sc., Ph.D., D.Sc.

9. Title: Investigation of signaling mechanisms that regulate cartilage maturation
Tutor: Róza Zákány M.D., Ph.D.

10. Title: Investigation of neuronal network development in the spinal cord
Tutor: Zoltán Mészár M.Sc., Ph.D.

11. Title: Identification of genes and proteins which play important role in the induction and maintenance of chronic inflammatory pain. Supervisior: Krisztina Hollo MSc, PhD
Tutor: Krisztina Holló M.Sc., Ph.D.

12. Title: Correlative physiological and morphological investigation of propriospinal connections in the spinal dorsal horn
Tutor: Zsófia Antal M.D.

Department of Anesthesiology and Intensive Care

1. Title: Sepsis associated encephalopathy
Tutor: Béla Fülesdi M.D., Ph.D., D.Sc.

Department of Biochemistry and Molecular Biology

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

3. Title: Genetic modification of mesenchymal stem cells and differentiation into macrophages.
4. Title: Investigation of the phagocytosis of apoptotic cells
5. Title: The anti-inflammatory role of adenosine A2A receptor.
6. Title: The anti-inflammatory role of membrane-bound TNFalpha
7. Title: The potential role of LXR receptor in the dexamethasone-induced phagocytosis of apoptotic cells.
8. Title: The role of adenosine A3 receptor in mediating anti-inflammatory action of apoptotic cells.
9. Title: The role of transglutaminase 2 in calcium homeostasis.
Tutor: Zsuzsa Szondy M.D., Ph.D., D.Sc.

10. Title: The role of retroviral proteases in the retroviral life cycle.
Tutor: József Tőzsér M.Sc., Ph.D., D.Sc.

11. Title: The role of tissue transglutaminase in rolling and adhesion of neutrophil granulocytes
Tutor: Zoltán Balajthy M.Sc., Ph.D.

12. Title: Saliva biomarkers of oral cancer.
Tutor: Beáta Scholtz M.Sc., Ph.D.

13. Title: Production of dendritic cells and macrophages from embryonic stem cells.
14. Title: Transcriptional reprogramming of murine embryonic stem cell progenitors.
Tutor: István Szatmári M.Sc., Ph.D.

15. Title: The epigenetic components of transcriptional regulation.
Tutor: Bálint Bálint L. M.D., Ph.D.

16. Title: Identification and regulation of the endogenous RXR ligand.
Tutor: Ralph Rühl M.Sc., Ph.D.

17. 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.

18. Title: Characterization of primary cells from patients with high risk for coeliac disese: immunofluorescent staining, migration assays, mobility assays.

19. Title: The effect of auto-antibodies from coeliac disease patients on the activity of tissue transglutaminase. Epitope mapping of auto-antibodies, development of a specific diagnostic test for coeliac disease, therapeutic applications.
Tutor: Ilma Korponay-Szabó M.D., Ph.D.

20. Title: Quantitative proteomic analysis of the tear proteins of diabetic patients.
Tutor: Éva Csősz M.Sc., Ph.D.

21. Title: Identification of regulatory SNPs in promoter regions of different species by bioinformatic analyses.
Tutor: Endre Barta M.Sc., Ph.D.

22. Title: The role of aim2 protein and native immune response in inhibiting cell proliferation
Tutor: Máté Demény M.D.,Ph.D.

23. Title: Alterations in structural properties of the transcription machinery in relation to disease development
24. Title: Molecular factors in cell differentiation
25. Title: Studying the re-programming mechanisms of viral proteins.
26. Title: The role of signaling pathway perturbations in cancer development
Tutor: Mónika Fuxreiter M.Sc., Ph.D.

Division 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 Ph.D.,M.Sc.

3. Title: The role of oxidation of biomolecules by catalysation of metal ions in the development and onset of neurodegenerative disorders. (A literature survey)
Tutor: Csilla Kállay M.Sc., Ph.D.

Divison of Cardiac Surgery

1. Title: Evaluation of the antibacterial effect of different skin preparation techniques in cardiac surgery
2. Title: The effect of carbon dioxide deairing during valve surgery - review of the literature
Tutor: Tamás Szerafin M.D., Ph.D.

3. Title: Short-term results of operations accomplished in A-type aortic dissections
Tutor: Tamás Maros M.D.

4. Title: Mitral valve repair-review of the literature
Tutor: István Szentkirályi M.D.

5. Title: Mid-term results of aortic valve sparing operations
Tutor: Ambrus Horváth M.D.

6. Title: Comparison of the effects of different anticoagulation therapies after aortic bioprothesis implantation.
Tutor: Lehel Palotás M.D.

Department of Biophysics and Cell Biology

1. Title: Investigation of cell surface distribution of erbB-2 oncoprotein in breast tumor cell lines.
2. Title: Role of tumor stem cells in trastazumab resistant breast tumors
Tutor: János Szöllősi M.Sc., Ph.D., D.Sc.

3. Title: Studying the inactivation of voltage gated potassium ion channels in heterologous expression systems.
Tutor: György Panyi M.D., Ph.D., D.Sc.

4. Title: Epigenetic regulation of nucleosome-DNA cohesion
5. Title: Interactions between ABC transporters and their membrane environment
Tutor: Gábor Szabó M.D., Ph.D., D.Sc.

6. Title: Mathematical analysis and computer modelling of the topology of cell surface proteins.
7. Title: Role of MHC in the organization of cell surface proteins
Tutor: László Mátyus M.D., Ph.D., D.Sc.

8. Title: Examination of the channel function properties of the P170 multidrug pump by patch-clamp.
Tutor: Zoltán Krasznai M.Sc., Ph.D.

9. Title: Cytometry of cytotoxic lymphocytes
10. Title: Physiological roles of the multidrug resistance transporter P-glycoprotein.
Tutor: Zsolt Bacsó M.D., Ph.D.

11. Title: Elucidation of the catalytic mechanism of ABC transporters
Tutor: Katalin Goda M.Sc., Ph.D.

12. Title: 3-dimensional reconstruction of chromosome conformations based on whole-genome contact probability data
13. Title: Histone point mutations affecting epigenetic modifications: impact on chromosome architecture
Tutor: Lóránt Székvölgyi M.Sc., Ph.D.

14. Title: Biophysical analysis and functional significance of cell surface protein patterns in T cell-mediated immune responses
Tutor: Andrea Dóczy-Bodnár M.Sc., Ph.D.

15. Title: Studying nuclear receptor function by modern microsocpy techniques
Tutor: György Vámosi M.Sc., Ph.D.

16. Title: Quantitative investigation of the associations of ErbB proteins using biophysical and molecular biological methods
17. Title: The correlation between the metastatic potential and chemoresistance of breast tumors with the expression level and association state of ErbB proteins
Tutor: Péter Nagy M.D., Ph.D.

18. Title: Molecular mechanisms of anticancer immune therapy.
19. Title: Role of molecular interactions between receptor tyrosine kinases and integrins in the therapy resistance of tumors.
Tutor: György Vereb M.D., Ph.D., D.Sc.

20. Title: Comparative study on Kv1.3 channels conjugated with fluorescent proteins
Tutor: Péter Hajdu M.Sc., Ph.D.

Division of Cardiology

1. Title: Electrical treatment modalities in heart failure
2. Title: Novel treatment modalities in atrial fibrillation (catheter ablation, surgery and pacemakers)
Tutor: Zoltán Csanádi M.D., Ph.D.

3. Title: Drug-eluting stents
Tutor: Zsolt Kőszegi M.D., Ph.D.

4. Title: Cardiovascular aspects of diabets mellitus
5. Title: Left ventricular function of obese patients.
Tutor: Tibor Fülöp M.D., Ph.D.

6. Title: Antithrombotic therapy in patients with ischaemic heart disease.
Tutor: Tibor Szűk M.D., Ph.D.

7. Title: Supraventicular arrhythmias.
Tutor: Csaba Kun M.D.

8. Title: Intensive therapy in acute coronary syndrome.
Tutor: Miklós Szokol M.D.

9. Title: The role of echocardiography in staving off complication of myocardial infarction.
Tutor: Ildikó Farkas-Rácz M.Sc.

10. Title: Stem cell therapy after myocardial infarction.
Tutor: László Balogh M.D.

11. Title: Aspirin - resistency
Tutor: Nóra Homoródi M.D.

12. Title: Cardiovascular complications of dermatomyositis.
Tutor: Andrea Péter M.D.

13. Title: Secondary prevention after primary PCI.
Tutor: László Fülöp M.D., Ph.D.

Division of Botany

1. Title: Stress tolerance and resistance mechanisms of higher plants
Tutor: Ilona Mészáros M.Sc., Ph.D., C.Sc.

2. Title: The study of chromatin and microtubule organization in cells of higher plants
Tutor: Csaba Máthé M.Sc., Ph.D.

3. Title: Plant bioactive compounds
Tutor: Gábor Vasas M.Sc., Ph.D.

4. Title: Role of glycoproteins in infection and immunology (bibliographic)
Tutor: János Kerékgyártó M.Sc., Ph.D., C.Sc.

Division of Clinical Physiology

1. Title: Improvement of myocardial inotropy under physiological and pathological conditions
Tutor: Zoltán Papp M.D., Ph.D., D.Sc.

2. Title: The role of posttranslational modifications in the contractile regulation of the heart.
3. Title: The role of vanilloid receptors in cardiovascular regulatory mechanisms
Tutor: Attila Tóth M.Sc., Ph.D.

Department of Human Genetics

1. Title: Characterization of factor-C protein family using sequence databases.
2. Title: Expression of WT1 and its splice variants in different diseases studied by real time PCR.
3. Title: Study of a gene regulating differentiation in bacteria.
4. Title: Study of the WT1 gene in urogenital malformations.
Tutor: Sándor Biró M.Sc., Ph.D., D.Sc.

5. Title: Human disease models in animals and lower eukaryotes (review).
Tutor: Zsigmond Fehér M.D., Ph.D.

6. Title: Ca++-binding proteins in Streptomyces
7. Title: Isolation of mono-ADP-ribosylated proteins from pro- and eukaryotic cells.
Tutor: András Penyige M.Sc., Ph.D.

8. Title: Chromosome-tracking studies in complex diseases.
Tutor: György Vargha M.D., Ph.D.

9. Title: Factor-C: a protein regulating differentiation in Streptomycetes.
Tutor: Judit Keserű M.Sc., Ph.D.

10. Title: Functional analysis of the Streptomyces facC gene in Aspergillus
Tutor: Melinda Paholcsek M.Sc.

11. Title: Global analysis of the human blood plasma epitome and interactome in health and disease.
12. Title: Use of comparative monoclonal antibody proteomics to detect three dimensional conservation relevant to protein function.
Tutor: László Takács M.D., Ph.D., D.Sc., M.H.A.Sc.

13. Title: Copy number variation of WT-1 gene in hematological conditions
Tutor: Dániel Ernő Beyer M.Sc., Ph.D.

14. Title: Factor-A mediated regulation of differentiation in Streptomyces griseus
Tutor: Melinda Szilágyi-Bónizs M.Sc., Ph.D.

Department of Clinical Oncology

1. Title: New therapic targets in breast cancer treatment
2. Title: Prognostic and predictive factors of breast cancer
Tutor: Zsolt Horváth M.D., Ph.D.

3. Title: Endocrine therapy of breast cancer
Tutor: Judit Kocsis M.D., Ph.D.

Department of Immunology

1. Title: Phenotypic and functional properties of dendritic cells
Tutor: Éva Rajnavölgyi M.Sc., Ph.D., D.Sc.

2. Title: Functional properties of proteins of SLAM receptor family in dendritic cells
3. Title: Identification and functional analysis of adaptor proteins in dendritic cells
Tutor: Árpád Lányi M.Sc., Ph.D.

4. Title: Investigation of effects of adjuvant factors released by allergenic materials on epithelial cells
5. Title: Role of reactive oxygen species generated by pollen grains in the pathomechanisms of allergic reactions
Tutor: Attila Bácsi M.Sc., Ph.D.

6. Title: Cellular interactions between dendritic cells and CD1 specific T-lymphocytes
Tutor: Péter Gogolák M.Sc., Ph.D.

7. Title: Study of non-apoptotic cytotoxic processes during immune response,new way of killing apoptosis resistant tumor cells
Tutor: Gábor Koncz M.Sc., Ph.D.

Department of Laboratory Medicine

1. Title: Investigation of thrombosis and inflammation in PSGL-1 deficiency.
2. Title: The effect of thrombotic and inflammatoric stimuli on platelet activation
Tutor: János Kappelmayer M.D., Ph.D., D.Sc.

3. Title: Functional analysis of antimicrobial fusion proteins
4. Title: Molecular genetic diagnostics of hematological and other malignant diseases
Tutor: Péter Antal-Szalmás M.D., Ph.D.

5. Title: Molecular genetic diagnosis of cystic fibrosis
6. Title: Molecular genetic diagnosis of severe inherited disease
Tutor: István Balogh M.Sc., Ph.D.

7. Title: Analysis of stem cell mobility during pheripherial stem cell transplantation
8. Title: Application of FXIII-A in the detection of minimal residual disease in acute lymphoblastic leukemia
Tutor: Zsuzsa Hevessy M.D., Ph.D.

9. Title: Laboratory diagnostic of osteoporosis
Tutor: Harjit Pal Bhattoa M.D., Ph.D.

10. Title: Investigation of G-CSF treatment in PSGL-1 deficient mice
11. Title: Laboratory diagnosis of hereditary spherocytosis
Tutor: Kornél Miszti-Blasius M.D., Ph.D.

12. Title: Applications of calculated GFR
Tutor: Anna Oláh M.Sc., Ph.D.

13. Title: Detection of minimal residual disease using flow cytometry
Tutor: László Csáthy M.D.

14. Title: The significance of the laboratory investigation of HE4 in cystic fibrosis
Tutor: Béla Nagy Jr. M.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: Radiotherapy of breast cancer
Tutor: Andrea Furka M.D., Ph.D.

5. Title: Anti-oxidant capacity of irradiated skin in cancer patients
Tutor: Imre Szabó M.D., Ph.D.

6. Title: Image Guided Radiotherapy (IGRT)
Tutor: Levente Jánváry M.D.

Division of Clinical Laboratory Science

1. Title: New chromogenic assay to detect APC resistance
Tutor: László Muszbek M.D., Ph.D., D.Sc., M.H.A.Sc.

2. Title: Determination of B2-microglobulin by nephelometric methods
3. Title: Determination of free kappa and lambda light chains in serum
4. Title: Development of an immunoassay for the determination of free FXIII-B subunit

5. Title: Method development for the detection of various alpha2 plasmin inhibitor isoforms
Tutor: Éva Katona M.Sc.

6. Title: Inherited hemostasis disorders; laboratory and molecular genetic aspects
7. Title: Laboratory monitoring of the new generation oral anticoagulants
8. Title: New diagnostic methods in Protein S deficiency.
Tutor: Zsuzsanna Bereczky M.D., Ph.D.

9. Title: Fibrinolytic marker levels and polymorphisms in ischemic stroke patients
10. Title: Local hemostasis alterations in the left atrium of patients with atrial fibrillation
11. Title: Novel biochemical and clinical aspects of the role of FXIII in fibrinolysis
Tutor: Zsuzsa Bagoly M.D., Ph.D.

12. Title: Coagulation factor and inhibitor levels in end-stage renal disease
13. Title: Development of an inhibitor peptide of blood coagulation factor XIII
14. Title: The interactions of blood coagulation factor XIII B subunit with different proteins
Tutor: Krisztina Pénzes-Daku M.Sc.

15. Title: The origin of factor XIII in tears.
Tutor: Zsuzsanna Orosz M.D., Ph.D.

Department of Dermatology

1. Title: Ablative laser treatment in Hailey-Hailey disease
2. Title: Genetic susceptibility in psoriasis
3. Title: Laser therapy of vascular skin lesions
4. Title: Lipid metabolism in psoriasis
Tutor: Éva Remenyik M.D., Ph.D., D.Sc.

5. Title: Importance of sentinel node dissection in the complex therapy of melanoma
6. Title: Modern moist wound dressings with simultaneous effective antibacterial properties in the treatment of difficult to heal wounds
7. Title: Possibilities of scar correction
Tutor: István Juhász M.D., Ph.D., C.Sc.

8. Title: Significance of compression therapy in treating venouos leg ulcer
Tutor: Zoltán Péter M.D.

9. Title: Clinical and laboratory examinations in the chronic urticaria
Tutor: Beatrix Irinyi M.D., Ph.D.

10. Title: New approaches in the classification and therapy of chronic urticaria
Tutor: Krisztián Gáspár M.D.

11. Title: Role of lipid environment in the activation of dermal macrophages
12. Title: Skin symptoms with lipid abnormalities
Tutor: Dániel Törőcsik M.D., Ph.D.

13. Title: Opalizumab therapy in chronic urticaria
14. Title: The effect immuntherapy on the barrier functions of patient suffering from atopic dermatitis
Tutor: Andrea Szegedi M.D., Ph.D., D.Sc.

15. Title: Lymphodrainage treatment in Dermatology
Tutor: Éva Szabó M.D.

Department of Medical Chemistry

1. Title: Ser/Thr-specific protein phosphatases in the control of signal transduction of mammalian cells
Tutor: Pál Gergely M.Sc., Ph.D., D.Sc., M.H.A.Sc.

2. Title: Molecular biology of protein phosphatases
Tutor: Viktor Dombrádi M.Sc., Ph.D., D.Sc.

3. Title: Interaction of protein phosphatase 1 catalytic subunit with regulatory proteins
Tutor: Ferenc Erdődi M.Sc., Ph.D., D.Sc.

4. Title: Mechanism of oxidative stress-induced cell death
5. Title: Mesenchymal Stem Cell differentiation
Tutor: László Virág M.D., Ph.D., D.Sc.

6. Title: Scaffolding proteins in the endothelium
Tutor: Csilla Csortos M.Sc., Ph.D.

7. Title: Functional study of the PPP family of plant protein phosphatases
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 regulation of neurotransmitter release
Tutor: Beáta Lontay M.Sc., Ph.D.

11. Title: Interaction of protein phosphatases with inhibitory molecules
Tutor: Andrea Kiss M.Sc., Ph.D.

12. Title: High-Throughput Screening
Tutor: Csaba Hegedűs M.Sc., Ph.D.

Department of Infectious Diseases and Pediatric Immunology

1. Title: C.difficile infection in infectious pediatric cave units

2. Title: Differential diagnosis in bloody diarrhoea of infectious origin
Tutor: Leonóra Méhes M.D.

3. Title: Antimicrobial host defense mechanisms in mature newborns
4. Title: Conjugated vaccines in the pediatric practice
5. Title: DNA vaccines
6. Title: Mucocutan candida infections
7. Title: Nosocomial infections in pediatric care units
8. Title: Passive immunization with immunoglobulins
9. Title: Pediatric AIDS
Tutor: László Maródi M.D.,Ph.D.,D.Sc.

10. Title: Antifungal chemotherapy
11. Title: Clinical manifestations in hyper-IgE syndrome
12. Title: Complicated varicella infections
13. Title: EBV infection in children
14. Title: Enzyme replacement therapy in Gaucher disease
15. Title: Etiopathology of infections in hyper-IgM syndrome
16. Title: Expression and function of mutated proteins in Shwachman-Diamond syndrome
17. Title: Intravenous immunoglobulin therapy in autoimmune disorders
18. Title: Invasive pneumococcal infections in primary immunodeficiency disorders
19. Title: Lyme-disease
20. Title: Pneumococcal polysaccharide vaccines
21. Title: Principle and practice of antimicrobial therapy
22. Title: Selective antipolysaccharide antibody deficiency
23. Title: The clinics, pathomechanism and molecular genetics of Shwachman-Diamond syndrome
24. Title: WHIM syndrome
Tutor: Melinda Erdős M.D., Ph.D.

25. Title: Principle and practice in the treatment of the lower respiratory tract infections
26. Title: Wiskott-Aldrich syndrome
Tutor: Vera Gulácsy M.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: Effects of human papillomavirus oncoproteins on the activity of cytoplasmic kinases in keratinocytes
Tutor: Anita Szalmás M.Sc., Ph.D.

7. Title: Molecular epidemiology of aminoglycoside resistance in nosocomial Gram negative bacteria
Tutor: Gábor Kardos M.D., Ph.D.

8. Title: Intratypical variation of human papillomaviruses
Tutor: György Veress M.Sc., Ph.D.

9. Title: Epidemiological characterisation of clinical MRSA isolates
Tutor: Zsuzsanna Dombrádi M.Sc., Ph.D.

10. Title: Prevalance of multidrug-resistant Acinetobacter baumanii in bloodstream infection
Tutor: Anita Kozák M.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., Ph.D., D.Sc.

5. Title: Lipid abnormalities in hypothyreoidism.
6. Title: The function of LDL in lipid metabolism
Tutor: György Paragh M.D., Ph.D., D.Sc.

7. Title: Diagnostic tests and imaging techniques in endocrinology.
Tutor: Endre Nagy M.D., Ph.D., D.Sc.

8. Title: Antiarrhythmic drug treatment.
9. Title: Cardiac arrhythmias in patients end-stage renal failure.
10. Title: Pacemaker treatment and myocardial infarction.
11. Title: Pathophysiology of neurocardiogenic syncope.
12. Title: Rhythm disturbances and the autonomic system of the heart.
13. Title: Ventricular repolarization and drugs.
Tutor: István Lőrincz M.D., Ph.D.

14. Title: Investigations of lipoproteins in normo- and hypercholesterinemic patients.
Tutor: Judit Boda M.D.

15. Title: Characteristics of rare systemic vasculitides
16. Title: Sjögren's syndrome associated with other autoimmune disease
Tutor: Margit Zeher M.D., Ph.D., D.Sc.

17. Title: Effect of physical activity on physiological parameters elderly people
18. Title: Incidence of thyroid diseases in elderly.
Tutor: Gyula Bakó M.D., Ph.D., D.Sc.

19. Title: The laboratory diagnosis of glutene sensitive enteropathies.
Tutor: Sándor Sipka M.D., Ph.D.

20. Title: Immunoregulatory abnormality in undifferentiated connective tissue disease
21. Title: The presence of antiphospholipide antibodies in the disease course of the MCTD
22. Title: Vascular involvement in mixed connective tissue disease.
23. Title: Vascular risk factors in undifferentiated connective tissue disease
Tutor: Edit Bodolay M.D., Ph.D., D.Sc.

24. Title: Dermato/polymyositis overlap with antiphospolipide syndrome.
25. Title: Genetical study in myositis
26. Title: Improvement of quality of life in polymyositis and dermatomyositis patients by physiotherapy
Tutor: Katalin Dankó M.D.,Ph.D.,D.Sc.

27. Title: Plasmapheresis treatment in intensive therapy
Tutor: Pál Soltész M.D., Ph.D., D.Sc.

28. Title: Autoimmune disorders and GI tract
Tutor: Zsolt Barta M.D., Ph.D.

29. Title: Ischemic colitis.
30. Title: Life quality of Raynaud syndrome
Tutor: Zoltán Csiki M.D., Ph.D.

31. Title: The disease course after stent inplantation in peripheral arterial disease
Tutor: György Kerekes M.D., Ph.D.

32. Title: Novel therapeutical approaches in multiple myeloma
33. Title: The impact of multi-drug resistance genes in the prognosis of lymphoproliferative disorders
Tutor: László Váróczy M.D., Ph.D.

34. Title: Inherited and acquired thrombophilia
35. Title: New direct oral anticoagulants
36. Title: Stem cell therapy in peripheral arterial disorders
Tutor: Zoltán Boda M.D.,Ph.D.,D.Sc.

37. Title: Gastric cancer: clinics and treatment
38. Title: Gastrointestinal bleeding
39. Title: Gluten sensitive enteropathy
40. Title: Inflammatory bowel diseases.
41. Title: Lymphomas in the gastrointestinal tract.
Tutor: István Altorjay M.D.,Ph.D.

42. Title: Langerhans histiocytosis
43. Title: Osteosclerotic myeloma
44. Title: Therapeutic challenges in rare haemostatic disorders
Tutor: György Pfliegler M.D., Ph.D.

45. Title: Epidemiology, diagnostics and therapy of chronic hepatitis C
46. Title: Pathomechanism of alcoholic hepatitis
47. Title: Signs, diagnostics and treatment of portal hypertension.
48. Title: Therapeutic options in primary sclerotizing cholangitis
49. Title: Treatment of autoimmune hepatitis
Tutor: István Tornai M.D.,Ph.D.

50. Title: A case history of an interesting acute myeloid leukaemia patient in the 2nd Department of Medicine (connection with the literature data)
Tutor: Attila Kiss M.D., Ph.D.

51. Title: Chronic neutrophilic leukaemia
Tutor: Béla Telek M.D., Ph.D.

52. Title: Therapeutic options of CML
Tutor: László Rejtő M.D., Ph.D.

53. Title: Biological treatment of ulcerative colitis
Tutor: Károly Palatka M.D., Ph.D.

54. Title: The role of Willebrand factor in various internal diseases.
Tutor: Ágota Schlammadinger M.D., Ph.D.

55. Title: Bacterial infection in liver cirrhosis
56. Title: Current therapeutic options of acute pancreatitis
Tutor: Zsuzsa Vitális M.D., Ph.D.

57. Title: Diagnosis and treatment of chronic lymphocytic leukemia
58. Title: Novel therapeutic approches in the treatment of multiple myeloma
59. Title: Philadelphia negative chronic myeloproliferative neoplasms - novel genetic and therapeutic improvements
60. Title: Recent advances in the management of chronic ITP
Tutor: Péter Batár M.D., Ph.D.

61. Title: Heparin-induced thrombocytopenia
Tutor: Zsolt Oláh M.D.

62. Title: Are the bacterial infections predictable in liver cirrhosis?
63. 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: Chromosome copy number and mutant allele density in cancer
5. Title: Expression of Aurora-kinases in lymphoproliferative diseases
6. Title: Mitotic rate and histone phosphorylation in cancer
Tutor: Gábor Méhes M.D., Ph.D.

7. Title: Clinicopathological studies in haemorrhagic stroke
8. Title: Clinicopathological studies in ischaemic stroke
9. Title: Molecular pathology of glial brain tumours
10. 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: Optional title in pharmacology
4. Title: Pharmacological and clinical significance of adenosine receptor antagonists
Tutor: József Szentmiklósi M.D., Ph.D.

5. Title: New trends in the treatment of diabetes
6. Title: Optional title in pharmacology
7. Title: Pharmacology of herbal remedies
8. Title: Possible pharmacological exploitations of TRPV1 receptors
Tutor: Róbert Pórszász M.D.,Ph.D.,MBA

9. Title: Effect of colony stimulating factors or other drugs on bone marrow-derived cell lines
10. Title: How insulin resistance influences drug effects
11. Title: Selected topic in field experimental hemato-oncology
Tutor: Ilona Benkő M.D., Ph.D.

12. Title: Investigation of insulin resistance and its cardiovascular complications
13. Title: Pharmacology of neurogenic inflammation
Tutor: Barna Peitl M.D., Ph.D.

14. Title: Optional title on cancer chemotherapy
Tutor: Attila Megyeri M.D., Ph.D.

15. Title: Optional title in pharmacology
Tutor: Ágnes Cseppentő M.D.

16. Title: Optional title on antibacterial chemotherapy
Tutor: Zsuzsanna Gál M.Sc., Ph.D.

Department of Physiology

1. Title: Alterations of [Ca2x]; in pathological conditions
Tutor: László Csernoch M.Sc., Ph.D., D.Sc.

2. Title: Electrophysiological properties of mammalian cardiac tissues
3. Title: Regional differences in the electrophysiological properties of cardiomyocytes
Tutor: Péter Nánási M.D., Ph.D., D.Sc.

4. Title: Significance of the alterations of the intracellular ion concentrations in the functional properties of neurones.
Tutor: Géza Szűcs M.D., Ph.D., D.Sc.

5. Title: Role of afterdepolarization mechanisms in the arrhythmogenesis
Tutor: Tamás Bányász M.D., Ph.D.

6. Title: Differential roles of protein kinase C isozymes in different cellular functions
7. Title: Studies on the vanilloid (capsaicin) receptor
Tutor: Tamás Bíró M.D.,Ph.D.,D.Sc.

8. Title: Expression and significance of the TASK channels in physiological and pathological conditions
Tutor: János Magyar M.D.,Ph.D.,D.Sc.

9. Title: Studies on ion channels incorporated into artificial membranes
Tutor: István Jóna M.Sc., Ph.D., D.Sc.

Division of Gastroenterology

1. Title: Gastric cancer: clinics and treatment
2. Title: Gastrointestinal bleeding
3. Title: Gluten sensitive enteropathy
4. Title: Inflammatory bowel diseases
5. Title: Lymphomas in the gastrointestinal tract
Tutor: István Altorjay M.D.,Ph.D.

6. Title: Epidemiology, diagnostics and therapy of chronic hepatitis C
7. Title: Pathomechanism of alcoholic hepatitis
8. Title: Signs, diagnostics and treatment of portal hypertension
9. Title: Therapeutic options in primary sclerotizing cholangitis
10. Title: Treatment of autoimmune hepatitis
Tutor: István Tornai M.D.,Ph.D.

11. Title: Biological treatment of ulcerative cholitis
Tutor: Károly Palatka M.D., Ph.D.

12. Title: Are the bacterial infections predictable in liver cirrhosis?
13. Title: Role of the serological markers in prediction of disease course and response to therapy in inflammatory bowel diseases
Tutor: Mária Papp M.D., Ph.D.

14. Title: Bacterial infection in liver cirrhosis
15. Title: Current therapeutic options of acute pancreatitis
Tutor: Zsuzsanna Vitális M.D., Ph.D.

Division of Haematology

1. Title: Immuno-chemotherapy in B-cell non-Hodgkin lymphomas
2. Title: Infections during aggressive therapies in lymphoma patients
3. Title: New monoclonal antibody based therapeutic approaches in the treatment of hematologic malignancies.
4. Title: Next generation sequencing and identification of mutations in lymphomas. New targets in therapy.
5. Title: The role of miRNA in the pathogenesis of lymphomas, possible targets for therapy
6. Title: Vaccination based therapies in lymphomas
Tutor: Lajos Gergely M.D., Ph.D., D.Sc.

7. Title: Examination of polyneuropathy in multiple myeloma patients treated with bortezomib
8. Title: New treatment approaches in multiple myeloma
9. Title: The role of autologous stem cell transplantation in the treatment of autoimmune disorders
10. Title: Treatment results in our multiple myeloma patients
Tutor: László Váróczy M.D., Ph.D.

11. Title: Therapeutic options of CML
Tutor: László Rejtő M.D., Ph.D.

12. Title: Diagnosis and treatment of chronic lymphocytic leukemia
13. Title: Novel therapeutic approaches in the treatment of multiple myeloma
14. Title: Philadelphia negative myeloproliferative meoplasms - novel genetic and therapeutic improvements
15. Title: Recent advances in the management of chronic ITP
Tutor: Péter Batár M.D., Ph.D.

Division of Rare Diseases

1. Title: Langerhans histiocytosis
2. Title: Osteosclerotic myeloma
3. Title: Therapeutic challenges in rare haemostatic disorders
Tutor: György Pfliegler M.D., Ph.D.

Division of Rheumatology

1. Title: Cardiopulmonary manifestation in systemic sclerosis
2. Title: Pulmonary arterial hypertension in systemic sclerosis.
Tutor: Gabriella Szűcs M.D., Ph.D.

3. Title: Rheumatology 2014 - 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: Efficacy of long-term therapy with biological agents in rheumatoid arthritis.
6. Title: Role of physiotherapy in the treatment of idiopathic inflammatory myopathy (review)
Tutor: Andrea Váncsa M.D., Ph.D.

7. Title: Diagnosis and therapy of early arthritis
Tutor: Nóra Bodnár M.D.

8. Title: Extra-articular manifestations of ankylosing spondylitis
9. Title: Modern treatment of spondyloarthritides
Tutor: Sándor Szántó M.D.,Ph.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: Chronic cerebrospinal venous insufficiency in Multiple Sclerosis.
Tutor: Tünde Csépány M.D., Ph.D.

5. Title: Effect of nicotin on cerebral hemodynamics in smokers.
Tutor: László Oláh M.D., Ph.D.

6. Title: Cardiovascular risk in sleep apnea.
7. Title: Hypoxic stress and its consequenses in sleep apnea.
8. Title: Obesity and sleep apnea.
Tutor: Tünde Magyar M.D., Ph.D.

Department of Neurosurgery

1. Title: Desmoplastic medullobalstoma.
2. Title: Epidemiology of brain tumors.
Tutor: Sándor Szabó M.D., Ph.D.

3. Title: Current treatment of hydrocephalus.
4. Title: Endoscopic treatment of intracranials cysts.
5. Title: Pediatric low grade gliomas.
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 Nuclear Medicine

1. Title: Development of E-learning material for nuclear medicine
Tutor: József Varga M.Sc., Ph.D.

2. Title: Posttherapeutic I-131 whole body SPECT/CT in patients with thyroid cancer
3. Title: The role of Tc99m-Tektrotyd SPECT/CT to evaluate metastatic neuroendocrine tumors
Tutor: Ildikó Garai M.D., Ph.D.

4. Title: Localisation of anatomical regions on CT scans with machine learning methods
Tutor: Zoltán Barta M.D.

5. Title: Screening of thyroid malignancy with scintigraphic methods (Tc99m pertechnetate and MIBI)
Tutor: Orsolya Sántha 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., Ph.D.

23. Title: Acceptance of invasive prenatal diagnostic tests
24. Title: Meiotic abnormalities and their clinical significance in human reproduction
25. Title: Role of Doppler ultrasound in antenatal care
Tutor: Tamás Szilveszter Kovács M.D., Ph.D.

26. Title: Anovulatory infertility
27. Title: Examination of genetic concerns about the safety of assisted reproduction
28. Title: Role of antimullerian hormone (AMH) in clinical practice
29. Title: Ultrasound dating in pregnancy
Tutor: Attila Jakab M.D., Ph.D.

30. Title: Aetiology and pathophysiology of pre-eclampsia
31. Title: Aetiology, prevention and treatment of vaginal infections
32. Title: Management of pre-eclampsia
33. Title: The modern tocolysis
34. Title: The role of prostaglandins in induction of labour
Tutor: János Zatik M.D., Ph.D.

35. Title: Advanced Laparoscopy in Gynecology
36. Title: Child sexual abuse
37. Title: Management of female urinary incontinence
38. Title: Minimal invasive therapy in Gynecology
Tutor: Roland Csorba M.D., Ph.D.

39. Title: Vaginal Birth After Cesarean
Tutor: Alpár Gábor Juhász M.D., Ph.D.

40. Title: Cervical cancer prevention: the role and the future of HPV vaccination besides conventional screening
41. Title: New treatment strategies in ovarian cancer
Tutor: Zoárd Krasznai M.D., Ph.D.

42. Title: Role of endoscopy in infertility work-up
Tutor: Péter Török M.D., Ph.D.

43. Title: Pregnancy care in PCOS patients
44. Title: Special aspects of pregnancy care in patients with endocrine disorders
45. Title: Thyroid autoimmunity - clinical significance, prevention and treatment in human reproduction
Tutor: Tamás Deli M.D., Ph.D.

46. Title: Transvaginal hydrolaparoscopy - a new method
47. Title: Hysteroscopic treatment of different gynecologic pathologies
48. Title: White blood cell function in preeclampsia
Tutor: Rudolf Lampé M.D., Ph.D.

49. Title: Contraception in the 21st century
Tutor: Balázs Erdődi M.D.

Division of Gynecological Oncology

1. Title: Chemotherapy of ovarian cancer
2. Title: Prognostic relevance of HPV-infection in cervical cancer
3. Title: Surgical treatment of HPV-infection
4. Title: The prognostic role of CA-125 in ovarian cancer
Tutor: Zoltán Hernádi M.D., Ph.D., D.Sc.

5. Title: Chemotherapy of cervical cancer
6. Title: Epidemiology and therapy of vulvar cancer
7. Title: Epidemiology of metastatic ovarian cancer
8. Title: Follow-up of endometrial cancer patients, analysis of prognostic factors
9. Title: Prothrombotic states in gynaecologic cancer
10. Title: Superoxid anion production of granulocytes in gynecologic cancer
Tutor: Róbert Póka M.D., Ph.D.

11. Title: Prognostic factors and treatment of cervical cancer
12. Title: The role of CA125 and HE4 in the follow-up of ovarian cancer
Tutor: Zoárd Krasznai M.D., Ph.D.

Department of Ophtalmology

1. Title: Immunological aspects of corneal transplantation
Tutor: László Módis M.D., Ph.D., D.Sc.

2. Title: Aesthetic and functional interventions in endocrine orbithopathy (Medicine and Dentistry)
Tutor: Erzsébet Balázs M.D., Ph.D.

3. Title: Intraocular tumors
Tutor: Judit Damjanovich M.D., Ph.D.

4. Title: Anti VEGF treatment for macular edema in retinal vein occlusion patients
5. Title: Ocular clinical signs in rare diseases
Tutor: Valéria Nagy M.D., Ph.D.

6. Title: Corneal dystrophies
Tutor: Lili Takács M.D., Ph.D.

7. Title: Nuclear medicine measurements in the inflammatory disorders of the eye's anterior segment
8. Title: Prospective study of vascular pathogenesis of eye diseases associated to rheumatologic and immunologic disorders
9. Title: Tear citokine measurements in inflammatory diseases of the anterior segment of the eye associated to immunological and autoimmunological disorders
10. Title: Tear-clearance measurements in dry eye syndrome with dacryoscintigraphy
Tutor: Ádám Kemény-Beke M.D., Ph.D.

11. Title: Contact lens wear and complications
12. Title: Cosmetical contact lenses
Tutor: Beáta Kettesy M.D.

13. Title: Corneal morfologic changes in diabetes
14. Title: Importance of screening in diabetic retinopathy
Tutor: Adrienne Csutak M.D., Ph.D.

15. Title: Ocular manifestations of albinism
16. Title: Pellucid marginal degeneration
Tutor: Mariann Fodor M.D., Ph.D.

17. Title: Assessment of the anterior and posterior surface of the cornea
18. Title: Higher order aberrations of the human eye
Tutor: Gábor Németh M.D., Ph.D.

19. Title: Diagnostic evolution in keratoconus
20. Title: Topometric and tomometric measurements in keratoconus
Tutor: Bence Kolozsvári M.D., Ph.D.

21. Title: Examination of peptide receptors in human uveal melanoma
22. Title: Results of orbital decompression surgeries
Tutor: Zita Steiber M.D.

23. Title: Color Doppler in the follow-up of choroidal melanoma after brachytherapy
24. Title: Fluorescein angiographic characteristics of choroidal melanoma
Tutor: Éva Surányi M.D.

25. Title: Genetic causes of high grade myopia
26. Title: Molecular genetic analysis of ocular fundus disorders
Tutor: Gergely Losonczy M.D., Ph.D.

27. Title: Graves' orbitopathy - current concepts in diagnosis and therapy
28. Title: Pathogenesis of Graves' orbitopathy
Tutor: Bernadett Ujhelyi M.D.,Ph.D.

29. 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
30. Title: Evaluate and demonstrate the results of the Hungarian Lucentis National Patient Registry
Tutor: Attila Vajas M.D.

31. Title: Congenital ptosis peculiar assotiated movements of the affected lid (Dentistry)
32. Title: Diagnosis and therapy in retinopathy of prematurity
33. Title: Non - surgical and surgical therapy of congenital ptosis
Tutor: Annamária Nagy M.D.

34. Title: BCVA changing after intravitreal ranibizumab injection
35. Title: IOP changing after intravitreal ranibisumab injection
Tutor: Erika Papp M.D.

Department of Orthopedic Surgery

1. Title: The role of arthrodesis in the treatment of degenerative arthritis of the knee.
2. Title: Treatment options in knee instability.
Tutor: Henrik Rybaltovszki M.D.

Department of Pediatrics

1. Title: Contemporary evalutation and treatment of medulloblastoma
2. Title: Thalassemia minor in North-East Hungary
Tutor: Csongor Kiss M.D., Ph.D., D.Sc.

3. Title: Beta-blocker therapy for preventing and treating cyanotic spells in pre-operative patients with tetralogy of Fallot
Tutor: Gábor Mogyorósy M.D., Ph.D.

4. Title: Hydrocephaly of infants
Tutor: Andrea Nagy M.D.

5. Title: IgA nephropathy in childhood
Tutor: Tamás Szabó M.D., Ph.D.

6. Title: Fungal infections in malignant hematology
Tutor: István Szegedi M.D., Ph.D.

7. Title: Experience with tissue adhesives in lip cleft surgery
Tutor: Ágnes Magyar M.D.

8. Title: Aldosteron producing suprarenal tumors in children
9. Title: Efficiency of Nordic Walking therapy in case of obese children regarding motivation for slimming
10. Title: Physiotherapy of diabetic children - prevention of hypoglycemia
Tutor: Enikő Felszeghy M.D.,Ph.D.

Department of Physical Medicine and Rehabilitation

1. Title: The importance of multidisciplinary rehabilitation to improve functional capacity, quality of life, cardiovascular function and metabolic parameters of obese patients, those suffering from osteoarthritis.
2. Title: The significance of conductive rehabilitation activities in gait development (gait analysis test)
Tutor: Zoltán Jenei M.D., Ph.D.

3. Title: Assessment of quality of life of people with disabilities or with the risk of disability
4. Title: Treatment of spasticity in children with cerebral palsy
Tutor: Zsuzsanna Vekerdy-Nagy M.D., Ph.D.

Department of Psychiatry

1. Title: Evoked potentials in alcoholic patients.
Tutor: Theodóra Glaub M.D.

2. Title: Cognitive theory and psychotherapy of psychosis
3. Title: Pharmacological non-compliance in schizophrenia
4. Title: The cognitive psychotherapy and fundamental principles of schema therapy
5. Title: The theory, the aim and use of cognitive-behavior psychotherapy in Obsessive-compulsive disorder
Tutor: Anikó Égerházi M.D., Ph.D.

6. Title: Brain imaging in psychiatry.
7. Title: The neurobiology of depression.
8. Title: The psychiatric and psychological sequalae of catastrophic trauma. Post-traumatic stress disorder and post-traumatic growth.
Tutor: Ede Frecska M.D., M.A., Ph.D.

Department of Pulmonology

1. Title: New perspectives in the treatment of lung cancer.
Tutor: Andrea Fodor M.D.

2. Title: New perspectives in the treatment of community acqiured pneumonia
Tutor: László Brugós M.D.

3. Title: NSCLC modern kezelése
Tutor: Tamás Kardos M.D.

Department of Surgery

1. Title: Differentiated thyroid cancer in Graves' disease
Tutor: Ferenc Győry M.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: Surgical treatment of adrenal tumors
5. Title: Surgical treatment of hyperthyroidism complicated with endocrine orbitopathie
Tutor: Ferenc Juhász M.D., Ph.D.

6. Title: Surgery of pulmonary metastases
7. Title: Surgical treatment of severe acute pancreatitis
Tutor: Zsolt Szentkereszty M.D., Ph.D.

8. Title: Laparoscopic fundoplication
Tutor: László Orosz M.D.

9. Title: The role of one-day surgery
Tutor: Csaba Bánfi M.D.

10. Title: Histopathologic examination of the carotid plaques regarding their possible prognostic value
Tutor: Krisztina Litauszky M.D.

11. Title: Liver resections for metastases of colorectal cancer
Tutor: János Pósán M.D.

12. Title: Prevention of bronchial stump insufficiency after lung resections
Tutor: István Takács M.D.,Ph.D.

13. Title: The clinical significance of occult malignancies
Tutor: Zoltán Garami M.D.

14. Title: Different forms of hereditary colorectal cancer among our patients.
Tutor: Miklós Tanyi M.D.,Ph.D.

15. Title: Mesh implantation in the surgical treatment of thoracic defects
16. Title: Surgical treatment of myasthenia gravis
Tutor: Attila Enyedi M.D.

17. Title: Assessment of risk factors associated with local recurrency in distal rectal cancer.
18. Title: Assessment of the results of hybrid operations during pelveo-femoral vascular reconstruction.
19. 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
Tutor: Ádám Deák D.V.M., Ph.D.

2. Title: New technical possibilities in surgery
Tutor: Andrea Furka M.D., Ph.D.

3. Title: Famous surgeons and famous discoveries
Tutor: Irén Mikó M.D., Ph.D.

4. Title: Changes of red blood cell mechanical stability in surgical pathophysiological processes
5. Title: Comparative analysis of international microsurgical courses - standardizational issues.
6. Title: Investigation of hemorheological and microcirculatory changes in ischemia-reperfusion, including therapeutical possibilities
Tutor: Norbert Németh M.D., MBA, Ph.D.

7. Title: Ischemia-reperfusion injury and its prevention with different methods.
Tutor: Katalin Pető M.D.,Ph.D.

8. Title: Chapters from the history of surgical asepsis, antisepsis
Tutor: Ferenc Kiss M.D., Ph.D.

9. Title: Tissue engineering in microsurgery
Tutor: Enikő Tóth M.D.

10. Title: New methods and techniques in microsurgery
Tutor: Zoltán Klárik M.D.

Department of Urology

1. Title: Laparoscopic operations
Tutor: Tibor Flaskó M.D., Ph.D.

2. Title: New challenges in treatment of renal cancer
Tutor: Csaba Berczi M.D., Ph.D.

3. Title: Fertility problems of males over 40
4. Title: Thrombosis prophylaxis of urological surgical procedures
Tutor: Mátyás Benyó M.D., Ph.D.

CHAPTER 22
LIST OF TEXTBOOKS

BMC

Introduction to Biophysics I.:
Serway/Vuille: College Physics.
9th edition. Brooks/Cole Cengage Learning, 2009. ISBN: 9780495386933.
Gáspár R.: Physics for BMC students.
University of Debrecen, .

Introduction to Medical Chemistry I.:
McMurry, J., Fay, R.C.: Chemistry.
6th edition. Pearson Education, 2012. ISBN: 978-0-13232-1464.

Introduction to Biology I.:
Sadava, Hillis, Heller, Berenbaum: Life: The Science of Biology.
10th edition. Sinauer Macmillan, 2013. ISBN: 978-1-4641-4124-9.

Introduction to Medical Chemistry II.:
McMurry, J., Fay, R.C.: Chemistry.
6th edition. Pearson Education, 2012. ISBN: 978-0-13232-1464.
F., Erdődi, Cs., Csortos: Organic Chemistry for Premedical Students.
University of Debrecen, 2011.

Introduction to Biology II.:
Sadava, Hillis, Heller, Berenbaum: Life: The Science of Biology.
10th edition. Sinauer Macmillan, 2013. ISBN: 978-1-4641-4124-9.

English for BMC students:
Soars, John and Liz: Headway - Pre-Intermediate Students' Book and Workbook.
The 3rd edition. Oxford, .

Hungarian Language for BMC students:
Marschalkó, Gabriella: Hungarolingua Basic Level 1.
Debreceni Nyári Egyetem, 2011.

Introduction to Biophysics II.:
Serway/Vuille: College Physics.
9th edition. Brooks/Cole Cengage Learning, 2009. ISBN: 9780495386933.
Gáspár R.: Physics for BMC students.
University of Debrecen, .

SBMC

Introduction to Biology:
Sadava, Hillis, Heller, Berenbaum: Life: The Science of Biology.
10th edition. Sinauer Macmillan, 2013. ISBN: 978-1-4641-4124-9.

Introduction to Medical Chemistry :
McMurry, J., Fay, R.C.: Chemistry.
6th edition. Pearson Education, 2012. ISBN: 978-0-13232-1464.
F., Erdődi, Cs., Csortos: Organic Chemistry for Premedical Students.
University of Debrecen, 2011.

Introduction to Biophysics:
Serway/Vuille: College Physics.
9th edition. Brooks/Cole Cengage Learning, 2009. ISBN: 9780495386933.

1st year
Hungarian Crash Course:
Marschalkó, Gabriella: Hungarolingua Basic Level 1.
Debreceni Nyári Egyetem, 2011.

Mathematics:
Fong Yuen, Wang Yuan: Calculus.
Springer, Singapore, 2000.

General Chemistry Theory:
J. McMurry, R. C. Fay: General Chemistry.
4th edition. Pearson Education Inc. , 2004. ISBN: 0-13-121631-7.

General Chemistry Practice:
J. McMurry, R. C. Fay: General Chemistry.
4th edition. Pearson Education Inc. , 2004. ISBN: 0-13-121631-7.

Pharmaceutical Biology I.:
Alberts B., D. Bray, K. Hopkin, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter: Essential Cell Biology.
4rd edition. Garland Science, 2014. ISBN: 978-0-8153-4455-1.

Latin Language I.:
Takácsné Tóth Emőke: Latin for Pharmacy Students.
Debrecen.2012.

Computer Science:
Greg Perry: Microsoft Office .

2007. ISBN: 9789-6396-3737-5.

Hungarian Language I/1. :

Győrffy Erzsébet, Ph.D.: Hogy s mint? I. .
2013.

Latin Language II.:

Répás, László - Bóta, Balázs: E-learning site for students of Medical terminology.
URL: http://www.medi-lingua.hu
Takácsné Tóth Emőke: Latin for Pharmacy Students II..
Debrecen.2012.

Inorganic and Qualitative Analytical Chemistry Theory:

McMurry, J., Fay, R.C.: Chemistry.
6th edition. Pearson Education, 2012. ISBN: 978-0-13232-1464.
G. Svehla (reviser): Vogel's qualitative inorganic analisis.
6th edition. Longman Scientific & Technical, copublished in the United States with John Wiley & Sons, Inc., 1994. ISBN: 0-582-45090-x.
N. N. Greenwood and A. Earnshaw: Chemistry of the elements.
2nd edition. Butterworth-Heinemann, Reed Educational and Professional Publishing Ltd., 1997. ISBN: 0-7506-3365-4.
H. F. Holtzlaw, Jr. W. R. Robinson: College Chemistry with Quantitative Analysis.
8th edition. D. O. Health and Company, Lexington, Massachusetts, Toronto, 1988. ISBN: 0-669-12862-7.
T. Moeller, J. C. Bailer, Jr., J. Kleinbert, C. O. Guss, M. E. Castellion, C. Metz: Chemistry with inorganic qualitative analysis.
8th edition. Academic Press Inc., 1980.
T. Moeller, R. O' Connor: Ions in Aquenous Systems, an introduction to chemical equilibrum and solution chemistry.
McGraw-Hill Book Companies, 1972. ISBN: 07-042647-3-.

Inorganic and Qualitative Analytical Chemistry Practice:

McMurry, J., Fay, R.C.: Chemistry.
6th edition. Pearson Education, 2012. ISBN: 978-0-13232-1464.
G. Svehla (reviser): Vogel's qualitative inorganic analisis.
6th edition. Longman Scientific & Technical, copublished in the United States with John Wiley & Sons, Inc., 1994. ISBN: 0-582-45090-x.
N. N. Greenwood and A. Earnshaw: Chemistry of the elements.
2nd edition. Butterworth-Heinemann, Reed Educational and Professional Publishing Ltd., 1997. ISBN: 0-7506-3365-4.
H. F. Holtzlaw, Jr. W. R. Robinson: College Chemistry with Quantitative Analysis.
8th edition. D. O. Health and Company, Lexington, Massachusetts, Toronto, 1988. ISBN: 0-669-12862-7.

Biophysics:

Biophyisics laboratory manual.
Department of Biophysics and Cell Biology, 2001.
Wayne W. Daniel: Biosatatistics: a foundation for analysis in the health sciences.
7th edition. John Wiley and Sons, New York, 1991. ISBN: 0-471-52988-5.
M. Shinitzky: Biomembranes. Physical aspects.
Vch. Weinheim, 1993. ISBN: 3-527-3021-x.
Edited by János Szőllősi: Medical Biophysics.
Medicina, 2009.
Materials.
URL: www.biophys.dote.hu
Textbook online.
URL: http://www.biophysics.org/education/resources.htm

Physical Chemistry I.:

Peter Atkins and Julio de Paula: Physical chemistry for life sciences.
or newer edition. Oxford University Press, 2006.
R. Chang: Physical chemistry with applications to biological systems.
Macmillan, New York, 1977.
P. W. Atkins, J. de Paula: Elements of Physical Chemistry.
4th or later edition. Oxford Univ. Press, 2005.

Organic Chemistry Theory I.:

T. W. G. Solomon, C. B. Fryhle: Organic chemistry.
8th edition. John Wiley and Sons Inc., 2004.
E. K. Meislich, H. Meilich, J. Sharefkin: 3000 solved problems in organic chemistry.
McGraw Hill Inc. , 1994.
T. Eicher, S. Hauptmann,: Chemistry of heterocycles: Structures, reactions, synthesis and applications.
2nd edition. John Wiley and Sons Inc., 2003.
E. L. Eliel, S. H. Wilen: Stereochemistry of organic compounds.
1st edition. John Wiley and Sons Inc., 1994.
R. Norman, J. M. Coxon: Principles of organic synthesis.
3rd edition. Blackie academic & Professional, 1993.
L.G. Wade Jr.: Organic Chemistry .
4th edition.1999.
J.A. Miller, E.F. Neuzil: Modern Experimental Organic Chemistry.
D.C. Heath and Company, 1980.

First Aid and Reanimation:

József Betlehem: First Things to Be Done in Emergencies – Providing First Aid for Health Professionals.
Medicina Könyvkiadó Zrt. , 2012.

Pharmaceutical Biology II.:

Hartl D. L.: Essential Genetics: A Genomics Perspective.
6th edition. Jones & Bartlett Publishers, 2014. ISBN: 978-1-4496-8688-8.
Practical Courses in Genetics.

University Medical School of Debrecen, 2002.
Thomas D. Gelehrter, Francis S. Collins, David Ginsburg: Principles of Medical Genetics.
2nd. Williams and Wilkins, 1998. ISBN: 0-683-03445-6.
Tom Strachan, Andrew P. Read: Human Molecular Genetics.
4th. Garland Science, 2011. ISBN: 0-8153-4184-9.
Robert L. Nussbaum, Roderick R. McInnes, Huntington F. Willard, Ada Hamosh: Thompson and Thompson Genetics in Medicine.
7th edition. Saunders Elsevier, 2007. ISBN: 978-1-4160-3080-5.
Campbell, A. M., Heyer, L. J.: Discovering genomics, proteomics and bioinformatics.
Pearson Education Inc. , . ISBN: 0-8053-4722-4.
Eberhard Passarge: Color Atlas of Genetics.
2nd edition. Georg Thieme Verlag, 2001. ISBN: 3-13-100362-6.

Hungarian Language I/2. :

Győrffy Erzsébet, Ph.D.: Hogy s mint? I. .
2013.

Pharmaceutical Anatomy:

K. L. Moore and A. M. R. Agur: Essential Clinical Anatomy.
2nd edition. Lippincott Williams & Wilkins, 2002. ISBN: 0-78172830-4-.
D. H. Cornmack: Essential Histology.
2nd edition. Lippincott Williams & Wilkins, 2001. ISBN: 0-7817-1668-3.
T. W. Sadler: Langman's Medical Embriology.
10th edition. Lippincott Williams & Wilkins, 2006. ISBN: 0-7817-9485-4.
Sobotta: Atlas of Human Anatomy I.-II..
14th edition. Urban & Schwarzenberg, . ISBN: 978-0-443-10349-0.

2nd year

Hungarian Language II/1. :

Győrffy Erzsébet, Ph.D.: Hogy s mint? II..
2013.

Organic Chemistry Theory II.:

T. W. G. Solomon, C. B. Fryhle: Organic chemistry.
8th edition. John Wiley and Sons Inc., 2004.
E. K. Meislich, H. Meilich, J. Sharefkin: 3000 solved problems in organic chemistry.
McGraw Hill Inc. , 1994.
T. Eicher, S. Hauptmann,: Chemistry of heterocycles: Structures, reactions, synthesis and applications.
2nd edition. John Wiley and Sons Inc., 2003.
E. L. Eliel, S. H. Wilen: Stereochemistry of organic compounds.
1st edition. John Wiley and Sons Inc., 1994.
R. Norman, J. M. Coxon: Principles of organic synthesis.
3rd edition. Blackie academic & Professional, 1993.
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4th edition.1999.
J.A. Miller, E.F. Neuzil: Modern Experimental Organic Chemistry.
D.C. Heath and Company, 1980.

Quantitative Analytical Chemistry Theory I. :

1. Skoog, D. A., West, D. M., Holler, F. J.: Fundamentals of Analytical Chemistry.
Saunders College Publ., 1988.
Braun, R. D.: Introduction to Instrumental Analysis.
Marcel Dekker Inc., 1987.
Fifield, F. W., Kealey, D.: Principles and Practice of Analytical Chemistry.
Blackie Academic and Professional, 1995.
Harris, D. C.: Quantitative Chemical Analysis.
W.H. Freeman and Company, 2003.

Human Physiology I. :

A. Fonyó: Principles of Medical Physiology.
Medicina Publishing House, Hungary, 2002. ISBN: 963-242-726-2.
R. M. Berne, M. N. Levy, B. M. Koeppen, B. A. Stanton: Physiology.
5th edition. V.C. Mosby Co., 2003.

Physical Chemistry II. :

Katalin Ősz, Attila Bényei: Physical Chemistry Laboratory Measurements (for students of Pharmacy, Chemistry and Chemical Engineering).
Egyetemi Kiadó, 2011.
P.W. Atkins: Physical Chemistry, Vols. I-III..
.
Peter Atkins and Julio de Paula: Elements of Physical Chemistry.
4th edition. Open University Press, 2005.
Dr. Katalin Ősz, 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.
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Cosgrowe T.: Colloid Science.
Blackwell, 2005.

Hungarian Language II/2.:

Győrffy Erzsébet, Ph.D.: Hogy s mint? II..
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Human Physiology II.:

A. Fonyó: Principles of Medical Physiology.
Medicina Publishing House, Hungary, 2002. ISBN: 963-

242-726-2.
R. M. Berne, M. N. Levy, B. M. Koeppen, B. A. Stanton: Physiology.
5th edition. V.C. Mosby Co., 2003.
Physiology Practice. A Laboratory Guide.
revised edition.2000.
Physiology Practice. Exercise Book.
revised edition.2000.

Pharmaceutical Biochemistry :

Thomas M. Devlin: Textbook of Biochemistry with Clinical Correlations.
6th edition. Wiley-Liss, 2006.
Ed. László Fésüs: Pharmaceutical Biochemistry on-line Syllabus, 2009..
URL: http://bmbi.med.unideb.hu

Pharmaceutical Technology I. Theory:

M.E. Aulton: Pharmaceutics: The science of dosage form design.
2002.
European Pharmacopoiea.
4th edition.2004.
Pharmacopoea Hungarica Editio VIII..
8th edition.2003.
Formulae Normales.
7th edition.2003.

Pharmaceutical Technology I. Practice:

Miklós Vecsernyés Ph.D., D.Pharm, Ildikó Bácskay Ph.D., D.Pharm: „Practicals in Pharmaceutical Technology - Prescription Pharmacy".
URL:
http://gyogyszertankonyv.med.unideb.hu/files/jPracticals-in-pharmaceutical-technology-2011.pdf

Pharmacognosy I. Theory:

William C Evans: Pharmacognosy.
16th. Saunders Ltd., 2009. ISBN: 978-0702029332.
J. Bruneton: Pharmacognosy, Phytochemistry, Medicinal Plants.
2nd ed.. Lavoisier, 1999. ISBN: 978-1898298632.

Pharmacognosy I. Practice:

William C Evans: Pharmacognosy.
16th. Saunders Ltd., 2009. ISBN: 978-0702029332.
J. Bruneton: Pharmacognosy, Phytochemistry, Medicinal Plants.
2nd ed.. Lavoisier, 1999. ISBN: 978-1898298632.
European Pharmacopoiea.
4th edition.2004.

Latin Medical Terminology:

Répás, L.: Basics of Medical Terminology.
Répás László, 2012.
Répás, László - Bóta, Balázs: E-learning site for students of Medical terminology.
URL: http://www.medi-lingua.hu

Modern biophysical methods in biology and medicine:

Damjanovich S., J. Fidy, J. Szöllősi : Medical Biophysics.
1st edition. Medicina, 2009. ISBN: 978 963 226 249 9.

3rd year

Pharmaceutical Technology II. Theory:

M.E. Aulton: Pharmaceutics: The science of dosage form design.
2002.

Clinical Biochemistry I.:

W.J. Marshall and S.K. Bangert: Clinical Chemistry.
6th edition. Mosby Elsevier Ltd., 2008. ISBN: 9-78072-343460-3.
Hoffbrand A.V., Pettit J.E.: Essential Haematology.
3rd edition. Blackwell Sciences, 1999. ISBN: 0-632-03083-6.
János Kappelmayer and László Muszbek: Practicals in laboratory medicine.
Debrecen, 2010.

Pharmacognosy II. Theory:

J. Bruneton: Pharmacognosy, Phytochemistry, Medicinal Plants.
2nd ed.. Lavoisier, 1999. ISBN: 978-1898298632.
William C Evans: Pharmacognosy.
16th. Saunders Ltd., 2009. ISBN: 978-0702029332.

Pharmacognosy II. Practice:

William C Evans: Pharmacognosy.
16th. Saunders Ltd., 2009. ISBN: 978-0702029332.
J. Bruneton: Pharmacognosy, Phytochemistry, Medicinal Plants.
2nd ed.. Lavoisier, 1999. ISBN: 978-1898298632.
European Pharmacopoiea.
4th edition.2004.

Pharmaceutical Chemistry I. Theory:

T. W. G. Solomon, C. B. Fryhle: Organic chemistry.
8th edition. John Wiley and Sons Inc., 2004.
J.H. Block and Beale, J.M.: Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry.
11th edition. Lippincott, 2004. ISBN: 0-7817-3481-9.

Medical Hungarian I.:

Krasznai, Mónika: Bevezetés a gyógyszerész szaknyelvbe.
2010.

Pharmaceutical Neurobiology:

Haines, D.E.: Fundamental Neuroscience Haines.
3rd edition. Churchill Livingstone, 2006. ISBN: 0-443-06751-1.
Moore K.L., A.F. Dalley, Anne MR Agur: Clinically

Oriented Anatomy.
6th edition. Lippincott Williams & Wilkins, 2009. ISBN: 978-1-60547-652-0.
Sobotta: Atlas of Human Anatomy I.-II..
14th edition. Urban & Schwarzenberg, . ISBN: 978-0-443-10349-0.
Ross M.H., W. Pawlina: Histology. A text and Atlas.
6th edition. Lippincott Williams & Wilkins, 2010. ISBN: 978-0-7817-7200-6.
T. W. Sadler: Langman's Medical Embriology.
10th edition. Lippincott Williams & Wilkins, 2006. ISBN: 0-7817-9485-4.
A. Fonyó: Principles of Medical Physiology.
Medicina Publishing House, Hungary, 2002. ISBN: 963-242-726-2.
Physiology Practice. A Laboratory Guide.
revised edition.2000.
Physiology Practice. Exercise Book.
revised edition.2000.
Biochemistry and Molecular Biology, Sillabus, Volume III. Chapter IX..
3rd edition.2002.

Pharmaceutical Technology III. Theory:

M.E. Aulton: Pharmaceutics: The science of dosage form design.
2002.

Clinical Biochemistry II.:

W.J. Marshall and S.K. Bangert: Clinical Chemistry.
6th edition. Mosby Elsevier Ltd., 2008. ISBN: 9-78072-343460-3.
Hoffbrand A.V., Pettit J.E.: Essential Haematology.
3rd edition. Blackwell Sciences, 1999. ISBN: 0-632-03083-6.
János Kappelmayer and László Muszbek: Practicals in laboratory medicine.
Debrecen, 2010.

Pharmaceutical Chemistry II. Theory:

T. W. G. Solomon, C. B. Fryhle: Organic chemistry.
8th edition. John Wiley and Sons Inc., 2004.
J.H. Block and Beale, J.M.: Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry.
11th edition. Lippincott, 2004. ISBN: 0-7817-3481-9.

Immunology:

Fred S. Rosen: Case studies in immunology.
3rd.2001.
Parham, P.: The Immune System.
Third Edition. Garland Science, 2009. ISBN: 0-8153-4146-6.
Abbul K. Abbas, Andrew H. Lichtman, Shiv Pillai: Basic Immunology.
Fourth Edition. Elsevier, . ISBN: 978-1-4557-0707-2.

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 .
Fifth Edition .2012. ISBN: 13: 978-0071390118.
Gordon M. Shepherd : The Synaptic Organization of the Brain.
Edition: 5.2003. ISBN: -10: 019515956X.

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.
MIT Press, Cambridge, Massachusetts, and London, England, 1991., . ISBN: ISBN 0-262-61071-X .

Latin Medical Terminology:

Répás, L.: Basics of Medical Terminology.
Répás László, 2012.
Répás, László - Bóta, Balázs: E-learning site for students of Medical terminology.
URL: http://www.medi-lingua.hu

Polymorphism of Pharmaceuticals:

Joel Bernstein: Polymorphism in Molecular Crystals. IUCr Monographs on Crystallography No. 14.
Calderon Press, Oxford , 2002.
D. Braga and F. Grepioni (Eds): Making Crystals by Design: Methods, Techniques and Applications.
Wiley, 2006.
Dr. Attila Bényei: Polymorphism of pharmaceuticals.
URL: http://fizkem.unideb.hu/physchem.html
: Diversity amidst Similarity. 35**th** crystallography course at Erice, Italy. .
URL: http://crystalerice.org/Erice2004/Diversity.htm

4th year

Pharmaceutical Technology IV. Theory:

M.E. Aulton: Pharmaceutics: The science of dosage form design.
2002.

Pharmacology I. Theory:

Laurence L. Brunton (editor): Goodman & Gilman's The pharmacological Basis of Therapeutics.
12th edition. McGraw Hill Medical, 2011. ISBN: 978-0-07175352-4.

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.
12th edition. McGraw Hill, 2012. ISBN: 978-0071774345.
Lajos Gergely: Diagnostic Medical Microbiology, Laboratory Exercises.
1989.
S. P. Denyer, N. A. Hodges & S. P. Gorman: Pharmaceutical Microbiology.
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Pharmaceutical and Bioanalytical Chemistry I.:

Kellner, Robert A.: Analytical Chemistry.
5th edition. Wiley-VCH, 1998.
Valcarcel M.: Automatic methods of analysis.
Elsevier, 1998.
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.
Semmelweis Egyetem Egészségtudományi Kar, 2012.

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12th edition. McGraw Hill Medical, 2011. ISBN: 978-0-07175352-4.
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