Subprogram 1: Medical Microbiology and Immunology Doctoral School of Interdisciplinary Medicine University of Szeged

Prof. Márta Széll
23/03/2021

Basic Module 1/subject credit *(min. 38 credits)*												
Basic module												
Course name	**Name of department coordinator**	**Total number of classes (hours)**	**Requirements**	**Number of credits in the given semesters**								**Total No. of credits**	**Form of evaluation**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
Computer-assisted research methodology	Department of Medical Physics and Informatics Prof. Ferenc Peták	28	C	-	6	-	-	-	-	-	-	6	E5
Scientific communication and publication. Methods, rules, and ethics	Department of Medical Biology Prof. Ernő Duda	14	C	-	3	-	-	-	-	-	-	3	E5
Biostatistics Lecture	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	6	-	-	-	-	-	-	-	6	E5
Biostatistics Practice	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	2	-	-	-	-	-	-	-	2	E3
Biomedical Ethics	Department of Behavioural Sciences Dr. Oguz Kelemen	14	C	-	3	-	-	-	-	-	-	3	E5
The total No. of credits in Basic Module 1				**8**	**12**	**-**	**-**	**-**	**-**	**-**	**-**	**20**	

[1] C (Compulsory subject)
2 E (Elective subject)
3 CE (Compulsory elective subject)

Compulsory subjects related to the PhD subprogram (specialization)													
Medical Microbiology and Immunology Subprogram													
Course name	**Name of department coordinator**	**Total number of classes (hours)**	**Requirements**	**Number of credits in the given semesters**								**Total No. of credits**	**Form of evaluation**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
The main pathogenicity factors of bacterial and viral infections	Department of Medical Microbiology and Immunobiology Dr. Katalin Burian	28	C	-	6	-	-	-	-	-	-	6	E5
Immune response against pathogens	Department of Medical Microbiology and Immunobiology Dr. Katalin Burian	28	C	-	6	-	-	-	-	-	-	6	E5
Research methods in microbiological investigations	Department of Medical Microbiology and Immunobiology Dr. Katalin Burian	28	C	-	6	-	-	-	-	-	-	6	E5
The total No. of credits for the compulsory subjects in the PhD sub-program (specialization)				-	18	-	-					18	
All compulsory trainings credits ***(the total No. of credits in the Basic module and for the compulsory subjects related to the PhD subprogram (specialization)***				**8**	**30**	**-**	**-**	**-**	**-**	**-**	**-**	**38**	

Module 2 Research Activity

(min. 130 credits) (30 hours = 1 credit)

Course name	Name of department coordinator	Total number of classes (hours)	Requirements	Number of credits in the given semesters								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
Research activity Semesters 1–8 *a total No. of 300 hours/semester)*	Department of Medical Genetics Prof. Márta Széll	300	CE	10	10	10	10	10	10	10	10		E3
Research activity Semesters 1–8 *a total No. of 450 hours/semester)*	Department of Medical Genetics Prof. Márta Széll	450	CE	15	15	15	15	15	15	15	15		E3
Research activity Semesters 1–8 *a total No. of 600 hours//semester)*	Department of Medical Genetics Prof. Márta Széll	600	CE	20	20	20	20	20	20	20	20		E3
Research report *(Up to 4 times/8 semesters)*	Department of Medical Genetics Prof. Márta Széll	14	C	-	3	-	3	-	3	-	3	12	E3
The total No. of credits for the Research activity				min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 130, max. 172	

The total No. of credits for the Training and Research activities:	min. 25, max. 35	min. 33, max. 46	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 168, max. 210	

Module 3 Teaching activity *(max. 8 credits can be given /semester, a total No. of min. 0 credit and max. 48 credits)*

Course name	Name of department coordinator	Total number of classes	Requirements	Number of credits in the given semesters								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
Teaching activity Semesters 1–8 (1 hour/week)	Department of Medical Genetics Prof. Márta Széll	14	E	2	2	2	2	2	2	2	2		E3

Teaching activity Semesters 1–8 (2 hours/week)	Department of Medical Genetics Prof. Márta Széll	28	E	4	4	4	4	4	4	4	4		E3
Teaching activity Semesters 1–8 (3 hours/week)	Department of Medical Genetics Prof. Márta Széll	42	E	6	6	6	6	6	6	6	6		E3
Teaching activity Semesters 1–8 (4 hours/week)	Department of Medical Genetics Prof. Márta Széll	56	E	8	8	8	8	8	8	8	8		E3
The total No. of credits for the Teaching activity:				0–8	0–8	0–8	0–8	0–8	0–8	0–8	0–8	min. 0, max. 48	

The total No. of credits for the Compulsory training + Research activity + Teaching activity:	min. 0, max. 43	min. 33, max. 54	min. 10, max. 28	min. 10, max. 31	min. 10, max. 28	min. 10, max. 31	min. 10, max. 28	min. 10, max. 31	min. 168, max. 218

Module 4 Publication activity

a training criterion unrelated to semesters (completion: min. 2 items, min. 65 credits, max. 90 credits)

Name of course	**Name of department coordinator**	**Total number of classes (hours)**	**Requirements**	**Number of credits in the given semesters**								**Total No. of credits**	**Form of evaluation**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
English article with no IF (8 hours a week) Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	112	E	20	20	20	20	20	20	20	20		E3
English article with IF (16 hours a week) Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	224	C	*45*	*45*	*45*	*45*	*45*	*45*	*45*	*45*		E3
Poster presentation at a Hungarian event Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	14	E	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		E3

Poster presentation at an international event (Hungary incl.) Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	28	E	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*		E3
Oral presentation at a Hungarian event Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	14	E	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		E3
Oral presentation at an international event Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	28	E	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*		E3

The total No. of credits for the Publication activity:		**65–81**	

***The total No. of credits* in Modules 1–4:** completion of min. 20, max. 45 credits / semester**;** a total of min. 240 credits / 8 semesters; max. 360 credits / 8 semesters	***min. 233, max. 289**	

A total of min. 240 credits / 8 semesters (7 credits are to be earned at optional courses, preferably courses offered by the graduate schools of the MSc, which are included in a separate description)

Compulsory subjects (Semesters 1–4)

1. Biostatistics Lecture 28 hours – 6 credits
2. Biostatistics Practice 28 hours – 2 credits

Total No. of credits in Semester 1: 8 credits

3. Computer-assisted research methodology 28 hours – 6 credits
4. Scientific literature 14 hours – 3 credits
5. Biomedical Ethics 14 hours – 3 credits

Total No. of credits in Semester 2: 12 credits

Compulsory subjects related to the PhD subprogram (specialization) (Semesters 1–4)

1. Medical Microbiology and Immunology subprogram:

1. The main pathogenicity factors of bacterial and viral infections (Semester 2 or 4) 28 hours – 6 credits
2. Immune response against pathogens (Semester 2 or 4) 28 hours – 6 credits
3. Research methods in microbiological investigations (Semester 2 or 4) 28 hours – 6 credits

Total No. of credits in Semesters 1–4: 18 credits

The training plan consists of 4 parts (modules).

STUDY REQUIREMENTS

General Rules:

- Minimum 18 and maximum 45 credits should be earned in each semester.
- Minimum 90 credits should be earned in Semesters 1–4, min. 90 credits are required for the admission to the complex examination.
- Students should earn minimum 240 credits during the 8 semesters (2 + 2 years).
- For doing teaching activity, 8 credits can be given per semester, up to a total of 48 credits.
- Research report: 3 credits for each; minimum 1 maximum 4 reports can be rewarded by a total of 12 credits.

Requirements for the complex examination:

The complex examination must be completed at the end of Year 2 (Semester 4).
Sum of all compulsory training credits (basic and subprogram (specialization) credits: 20 + 18 = 38 credits)
Compulsory subjects of the 3 subprograms of the Doctoral School of Theoretical Medicine, University of Szeged, of which min. 18 credits must be collected in Semesters 1–4.

Elective Subjects (Semesters 1–4)

Compulsory subjects related to the PhD subprogram (specialization)

Compulsory subject 1

Details of the course

Subject area:	Medical microbiology and immunology
Name of course:	**The main pathogenicity factors of bacterial and viral infections**
Name of department:	Department of Medical Microbiology and Immunobiology, Faculty of Medicine, University of Szeged
Coordinators:	Dr. Katalin Burián
Course requirement:	no
Course announcement (Fall or Spring semester)	Spring semesters
Suggested course registration:	Semester 2
Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	five-grade system

Maximum number of course registrations:	1 (course is not allowed to be repeated)
Department announcing the course:	Department of Medical Microbiology and Immunobiology, Faculty of Medicine, University of Szeged
Type of course:	theoretical
Type of examination:	written
Lecturers of the course:	Dr. Katalin Burián, Dr. Klára Megyeri, Dr. Valéria Endrész, Dr. Gabriella Spengler, Dr. Dezső Virók, Dr. Ferenc Somogyvári
* Topics of the course:	The role of cytopathogenicity triggered by medically important microbes in infections. The molecular mechanism and role of cytokine production in infections caused by pathogenic microorganisms. Secretion systems of bacteria. The role of bacterial exotoxins in infections Viral latency. The immunopathogenesis of chlamydial infections. Pathogenic mechanisms implicated in diarrheal diseases of various origins. Diseases caused by picornaviruses. Upper respiratory tract infections. The role of protein phosphorylation in the initial phase of host–pathogen interaction. Intracellular defense mechanisms against intracellular pathogens. Possibilities in the control of infectious diseases. Examination
*Required reading:	- Previously approved PhD dissertations prepared in the given field - Scientific publications available for target PubMed search - Study material provided by the contact department that can be downloaded from Coospace

Compulsory subject 2

Details of the course

Subject area:	Medical Microbiology and Immunology
Name of course:	**Immune response against pathogens**
Name of department:	Department of Medical Microbiology and Immunobiology, Faculty of Medicine, University of Szeged
Coordinators:	Dr. Katalin Burián
Course requirement:	non
Course announcement (Fall or Spring semester)	Spring semester
Suggested course registration:	Semester 2 or 4

Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	five-grade system
Maximum number of course registrations:	1 (Course is not allowed to be repeated)
Department announcing the course:	Department of Medical Microbiology and Immunobiology, Faculty of Medicine, University of Szeged,
Type of course:	theoretical–practical
Type of examination:	written
Lecturers of the course:	Dr. Katalin Burián, Dr. Klára Megyeri, Dr. Valéria Endrész, Dr. Gabriella Spengler, Dr. Dezső Virok, Dr. Ferenc Somogyvári
* Topics of the course:	Immune response against extracellular bacteria Immune response against intracellular bacteria Immune response against viruses Immune response against fungi Immune evading mechanisms of extracellular and intracellular bacteria Immune evading mechanisms of viruses Mechanism of cytokine storm and the role of it in bacterial and viral infections Influenza viruses and the immune responses against them Protective and pathologic immune responses during chlamydial infections The role of defensins during infections Immune response in tuberculosis and its influence on therapy The role of innate immune response in urinary tract infections Examination
*Required reading:	- PhD theses related to the topics - Scientific literature based on targeted PubMed search - Topic summaries posted by the Department on Coospace

C**ompulsory subject 3**

Details of the course

Subject area:	Medical Microbiology and Immunology
Name of course:	**Research methods in microbiological investigations**
Name of department:	Department of Medical Microbiology and Immunobiology, Faculty of Medicine, University of Szeged
Coordinators:	Dr. Katalin Burián
Course requirement:	non

Course announcement (Fall or Spring semester)	Spring semester
Suggested course registration:	Semester 2
Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	five-grade system
Maximum number of course registrations:	1 (Course is not allowed to be repeated)
Department announcing the course:	Department of Medical Microbiology and Immunobiology, Faculty of Medicine, University of Szeged,
Type of course:	theoretical–practical
Type of examination:	written
Lecturers of the course:	Dr. Katalin Burián, Dr. Klára Megyeri, Dr. Valéria Endrész, Dr. Gabriella Spengler, Dr. Dezső Virók, Dr. Ferenc Somogyvári
* Topics of the course:	Methods for examination of viral cytopathic effect. Culture, identification, and quantitation of viruses Gene expression analyses of host-pathogen interaction Methods for quantitation of obligate intracellular bacteria Microbiome analysis Serological methods Recombinant DNA techniques PCR in diagnostic microbiology Quantitative and real-time PCR Alternative molecular methods avoiding PCR patent restrictions Sequencing strategies Methods for investigation of bacterial efflux pumps Methods in research of bacterial quorum sensing and biofilms. Examination
*Required reading:	- PhD theses related to the topics - Scientific literature based on targeted PubMed search - Topic summary posted by the Department on Coospace

Subprogram 2: Preventive Medicine
Doctoral School of Interdisciplinary Medicine
University of Szeged

Basic Module 1/subject credit *(min. 38 credits)*
Basic module

Course name	Name of department coordinator	Total number of classes	Requirements	Number of credits in the given semester								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
Computer-assisted research methodology	Department of Medical Physics and Informatics Prof. Dr. Ferenc Peták	28	C	-	6	-	-	-	-	-	-	6	E5
Scientific communication and publication. Methods, rules, and ethics.	Department of Medical Biology Prof. Dr. Ernő Duda	14	C	-	3	-	-	-	-	-	-	3	E5
Biostatistics Lecture	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	6	-	-	-	-	-	-	-	6	E5
Biostatistics Practice	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	2	-	-	-	-	-	-	-	2	E3
Biomedical Ethics	Department of Behavioral Sciences Dr. Oguz Kelemen	14	C	-	3	-	-	-	-	-	-	3	E5
The total No. of credits in Basic Module 1				**8**	**12**	**-**	**-**	**-**	**-**	**-**	**-**	**20**	

1 C (Compulsory subject)
2 E (Elective subject)
3 CE (Compulsory elective subject)

Compulsory subjects related to the PhD subprogram (specialization)

PREVENTIVE MEDICINE Subprogram

Course name	Name of department coordinator	Total number of classes (hours)	Requirements	Number of credits in the given semesters								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
Epidemiological Methods (Semester 1 or 3)	Department of Public Health, Faculty of Medicine	28	C	6	-	-	-	-	-	-	-	6	E5

	Dr. Edit Paulik												
Prevention of Chronic Non-communicable Diseases (Semester 1 or 3)	Department of Public Health, Faculty of Medicine Dr. Edit Paulik	28	C	6	-	-	-	-	-	-	-	6	E5
Environmental Health (Semester 2 or 4)	Department of Public Health, Faculty of Medicine Dr. Edit Paulik	28	C	-	6	-	-	-	-	-	-	6	E5
The total No. of credits for the compulsory subjects in the PhD sub-program (specialization)				12	6	-	-					18	
All compulsory training credits (the total No. of credits in the Basic module and for the compulsory subjects related to the PhD subprogram (specialization)				**20**	**18**	-	-	-	-	-	-	**38**	

Module 2 Research Activity

(min. 130 credits) (30 hours = 1 credit)

Course name	**Name of department coordinator**	**Total number of classes (hours)**	**Requirements**	**Number of credits in the given semesters**								**Total No. of credits**	**Form of evaluation**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
Research activity Semesters 1–8 *a total No. of 300 hours/semester)*	Department of Medical Genetics Prof. Márta Széll	300	CE	10	10	10	10	10	10	10	10		E3
Research activity Semesters 1–8 *a total No. of 450 hours/semester)*	Department of Medical Genetics Prof. Márta Széll	450	CE	15	15	15	15	15	15	15	15		E3
Research activity Semesters 1–8 *a total No. of 600 hours//semester)*	Department of Medical Genetics Prof. Márta Széll	600	CE	20	20	20	20	20	20	20	20		E3

Research report *(Up to 4 times/8 semesters)*	Department of Medical Genetics Prof. Márta Széll	14	C	-	3	-	3	-	3	-	3	12	E3
The total No. of credits for the Research activity				min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 130, max. 172	

The total No. of credits for Training and Research activities:	min. 25, max. 35	min. 33, max. 46	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 168, max. 210	

Module 3 Teaching Activity *(max. 8 credits can be given /semester, a total of min. 0 credit and max. 48 credits)*

Course name	**Name of department coordinator**	**Total number of classes (hours)**	**Requirements**	**Number of credits in the given semesters**								**Total No. of credits**	**Form of evaluation**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
Teaching activity Semesters 1–8 (1 hour/week)	Department of Medical Genetics Prof. Márta Széll	14	E	2	2	2	2	2	2	2	2		E3
Teaching activity Semesters 1–8 (2 hours/week)	Department of Medical Genetics Prof. Márta Széll	28	E	4	4	4	4	4	4	4	4		E3
Teaching activity Semesters 1–8 (3 hours/week)	Department of Medical Genetics Prof. Márta Széll	42	E	6	6	6	6	6	6	6	6		E3
Teaching activity Semesters 1–8 (4 hours/week)	Department of Medical Genetics Prof. Márta Széll	56	E	8	8	8	8	8	8	8	8		E3
The total No. of credits for the Teaching activity:				0–8	0–8	0–8	0–8	0–8	0–8	0–8	0–8	min. 0, max. 48	

The total No. of credits for the Compulsory training + Research activity + Teaching activity:	min. 0, max. 43	min. 33, max. 54	min. 10, max. 28	min. 10, max. 31	min. 10, max. 28	min. 10, max. 31	min. 10, max. 28	min. 10, max. 31	min. 168, max. 218

Module 4 Publication Activity

a training criterion unrelated to semesters (completion: min. 2 items, min. 65 credits, max. 90 credits)

Name of course	Name of department coordinator	Total number of classes (hours)	Requirements	Number of credits in the given semesters								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
English article with no IF (8 hours a week) Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	112	E	20	20	20	20	20	20	20	20		E3
English article with IF (16 hours a week) Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	224	C	*45*	*45*	*45*	*45*	*45*	*45*	*45*	*45*		E3
Poster presentation at a Hungarian event Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	14	E	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		E3
Poster presentation at an international event (Hungary incl.) Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	28	E	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*		E3
Oral presentation at a Hungarian event Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	14	E	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		E3
Oral presentation at an international event Semesters 1–8	Department of Medical Genetics Prof. Dr. Márta Széll	28	E	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*		E3

The total No. of credits for the Publication activity:		**65–81**	

***The total No. of credits* in Modules 1–4:** completion of min. 20, max. 45 credits / semester**;** a total of min. 240 credits / 8 semesters; max. 360 credits / 8 semesters	***min. 233, max. 298**	

A total of min. 240 credits / 8 semesters (7 credits are to be earned at optional courses (preferably courses offered by the graduate schools of the MSc, which are included in a separate description)

Compulsory subjects (Semesters 1–4)

3. Biostatistics Lecture 28 hours – 6 credits
4. Biostatistics Practice 28 hours – 2 credits

Total No. of credits in Semester 1: 8 credits

3. Computer-assisted research methodology 28 hours – 6 credits
4. Scientific literature 14 hours – 3 credits
5. Biomedical Ethics 14 hours – 3 credits

Total No. of credits in Semester 2: 12 credits

Compulsory subjects related to the PhD subprogram (specialization) (Semester 1–4)

2. Preventive Medicine subprogram

1. Epidemiological Methods (Semester 1 or 3) 28 hours – 6 credits
2. Prevention of Chronic Non-communicable Diseases (Semester 1 or 3 28 hours – 6 credits
3. Environmental Health (Semester 2 or 4) 28 hours – 6 credits

Total No. of credits in Semesters 1–4: 18 credits

The training plan consists of 4 parts (modules).

STUDY REQUIREMENTS

General Rules:

- Minimum 18 and maximum 45 credits should be earned in each semester.

- Minimum 90 credits should be earned in Semesters 1–4, min. 90 credits are required for the admission to the complex examination.

- Students should earn minimum 240 credits during the 8 semesters (2 + 2 years).

- For doing teaching activity, 8 credits can be given per semester, up to a total of 48 credits.

- Research report: 3 credits for each; minimum 1 maximum 4 reports can be rewarded by a total of 12 credits.

Requirements for the complex examination:

The complex examination must be completed at the end of Year 2 (Semester 4).
Sum of all compulsory training credits (basic and subprogram (specialization) credits: 20 + 18 = 38 credits)
Compulsory subjects of the 3 subprograms of the Doctoral School of Theoretical Medicine, University of Szeged, of which min. 18 credits must be collected in Semesters 1–4.

Elective Subjects (Semesters 1–4**)**

Compulsory subject 1

Details of the course

Subject area:	**Preventive Medicine**
Name of course:	**Epidemiological Methods**
Name of department:	Department of Public Health, Faculty of Medicine, University of Szeged
Coordinators:	Dr. habil. Edit Paulik
Course requirement:	none
Course announcement (Fall or Spring semester)	Fall semester
Suggested course registration:	Year 1 or 2
Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	five-grade system
Maximum number of course registrations:	1 (The subject cannot be repeated)
Department announcing the course:	Department of Public Health, Faculty of Medicine ,University of Szeged
Type of course:	lecture
Type of examination:	oral+written
Lecturers of the course:	Dr. Edit Paulik, Dr. Edina Horváth, Dr. Anita Lukács, Dr. Regina Molnár, Dr. Anna Müller, Dr. Andrea Szabó, Csaba Erdős
* Topics of the course:	1. The history of epidemiology 2. Rates in epidemiology. Measuring morbidity, sources of data. Quantifying risk. 3. Classification of epidemiological studies. Ecological study, cross-sectional study. 4. Case-control study, cohort study. 5. Randomized controlled clinical trials. 6. Systematic reviews, meta-analysis. 7. Clinical epidemiology. 8. Health indicators, epidemiological databases. 9. Health interview surveys. 10. Measuring quality of life. 11. Planning of epidemiological studies 12. Collecting and processing data. Evaluation and publication of results. 13. Research ethics.
*Required reading:	Paulik E (ed.): Public Health and Preventive Medicine. Medicina Publishing House, Budapest, 2013 All material taught at lectures

Compulsory subject 2
Details of the course

Subject area:	**Preventive Medicine**
Name of course:	**Prevention of Chronic Non-communicable Diseases**
Name of department:	Department of Public Health, Faculty of Medicine, University of Szeged
Coordinators:	Dr. habil. Edit Paulik
Course requirement:	none
Course announcement (Fall or Spring semester)	Fall semester
Suggested course registration:	Year 1 or 2
Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	five-grade system
Maximum number of course registrations:	1 (The subject cannot be repeated)
Department announcing the course:	Department of Public Health, Faculty of Medicine, University of Szeged
Type of course:	lecture
Type of examination:	oral
Lecturers of the course:	Dr. László Nagymajtényi, Dr. Edit Paulik, Dr. Edina Horváth, Dr. Anna Müller
* Topics of the course:	Demographic situation in the world population National and international aspects of chronic non-communicable diseases (NCDs) General aspects of NCD's prevention Genetic factors and prevention Screening of chronic diseases, biomarkers. The role of the macro- and micro-environment in the development of NCDs cardiovascular diseases tumors respiratory diseases gastrointestinal diseases mental diseases Chronic diseases in disadvantaged population groups Risk assessment and chronic diseases The role of primary health in the prevention of NCDs National and international NCD related programs
*Required reading:	Paulik E (ed.): Public Health and Preventive Medicine. Medicina Publishing House, Budapest, 2013 Global action plan for the prevention and control of non-communicable diseases 2013-2020. World Health Organization, 2013

	All material taught at lectures

Compulsory subject 3
Details of the course

Subject area:	**Preventive Medicine**
Name of course:	**Environmental health**
Name of department:	Department of Public Health, Faculty of Medicine, University of Szeged
Coordinators:	Dr. habil. Edit Paulik
Course requirement:	none
Course announcement (Fall or Spring semester)	Spring semester
Suggested course registration:	Year 1 or 2
Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	five-grade system
Maximum number of course registrations:	1 (The subject cannot be repeated)
Department announcing the course:	Department of Public Health, Faculty of Medicine, University of Szeged
Type of course:	lecture
Type of examination:	oral
Lecturers of the course:	Dr. Edit Paulik, Dr. András Papp, Dr. Edina Horváth, Dr. Anita Lukács, Dr. Andrea Szabó, Dr. Tünde Vezér
Topics of the course:	1. Environment and health: physical, chemical, biological and social determinants. Avoidance of damages of environmental origin, concept and levels of prevention. 2. Air hygiene: Composition of the atmosphere, air pollutants and their sources, air pollution and its health consequences, norms, and regulation. 3. Water hygiene: Water reserves of the Earth, human activities affecting the state of natural bodies of water, production of drinking water, health effects of drinking water composition, and the problems of wastewater. 4. Soil hygiene: properties and self-purification of the soils, sources of soil pollution, connections between the soil and other environmental media, and health effects of soil pollution. Wastes and their environmental hygienic effects. Communal and hazardous waste. Health effects of the built

	environment (settlements, dwellings, and institutions). 5. Settlement hygiene. Hygienic requirements of educational and healthcare facilities. 6. Working place as micro-environment, effects of physical and mental burden on health. 7. Physical health-damaging factors: extremes of temperature and barometric pressure, noise, and vibration. 8. Physical health-damaging factors: ionizing and non-ionizing radiation, dusts and aerosols. 9. Chemical health-damaging factors: general toxicology, chemical safety, risk assessment and management. 10. Chemical health-damaging factors: toxicology of gases, solvents, and metals. 11. Chemical health-damaging factors: toxicology of plastics, pesticides, and persistent organic pollutants. 12. Biological health-damaging factors: pathogens, parasites, and general epidemiology. Some important infectious diseases. 13. Carcinogenic and teratogenic environmental influences. Allergens. 14. Health effects of foodstuffs as substances of environmental origin.
Required reading:	Paulik E (ed.): Public Health and Preventive Medicine. Medicina Publishing House, Budapest, 2013 All material taught at lectures

Subprogram 3: Medical Genetics and Genomics
Doctoral School of Interdisciplinary Medicine (University of Szeged)

Basic Module 1/subject credit *(min. 38 credits)*

Basic module

Course name	Name of department coordinator	Total number of classes	Requirements	Number of credits in the given semester								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
Computer-assisted research methodology	Department of Medical Physics and Informatics Prof. Dr. Ferenc Peták	28	C	-	6	-	-	-	-	-	-	6	E5
Scientific communication	Department of Medical Biology	14	C	-	3	-	-	-	-	-	-	3	E5

and publication. Methods, rules, and ethics.	Prof. Dr. Ernő Duda												
Biostatistics Lecture	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	6	-	-	-	-	-	-	-	6	E5
Biostatistics Practice	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	2	-	-	-	-	-	-	-	2	E3
Biomedical Ethics	Department of Behavioral Sciences Dr. Oguz Kelemen	14	C	-	3	-	-	-	-	-	-	3	E5
The total No. of credits in Basic Module 1				**8**	**12**	**-**	**-**	**-**	**-**	**-**	**-**	**20**	

1 C (Compulsory subject)
2 E (Elective subject)
3 CE (Compulsory elective subject)

Compulsory subjects related to the PhD subprogram (specialization)													
MEDICAL GENETICS AND GENOMICS subprogram													
Course name	**Name of department coordinator**	**Total number of classes (hours)**	**Requirements**	**Number of credits in the given semesters**								**Total No. of credits**	**Form of evaluation**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
Clinical Genetics 1	Department of Medical Genetics Prof. Márta Széll	28	C	-	6	-	-	-	-	-	-	6	E5
Clinical Genetics 2	Department of Medical Genetics Prof. Márta Széll	28	C	-	6	-	-	-	-	-	-	6	E5
Actualities in Human Genetics	Department of Medical Genetics Prof. Márta Széll	28	C	-	6	-	-	-	-	-	-	6	E5
The total No. of credits for the compulsory subjects in the PhD sub-program (specialization)				-	18	-	-					18	
All compulsory trainings credits (Total No. of credits in the Basic module and for the compulsory				**8**	**30**	**-**	**-**	**-**	**-**	**-**	**-**	**38**	

subjects linked to the PhD subprogram (specialization)										

Module 2Research Activity

(min. 130 credits) (30 hours = 1 credit)

Course name	Name of department coordinator	Total number of classes (hours)	requirements	Number of credits in the given semesters								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
Research activity Semesters 1–8 *a total No. of 300 hours/semester)*	Department of Medical Genetics Prof. Márta Széll	300	CE	10	10	10	10	10	10	10	10		E3
Research activity Semesters 1–8 *a total No. of 450 hours/semester)*	Department of Medical Genetics Prof. Márta Széll	450	CE	15	15	15	15	15	15	15	15		E3
Research activity Semesters 1–8 *a total No. of 600 hours/semester)*	Department of Medical Genetics Prof. Márta Széll	600	CE	20	20	20	20	20	20	20	20		E3
Research report *(Up to 4 times/8 semesters)*	Department of Medical Genetics Prof. Márta Széll	14	C	-	3	-	3	-	3	-	3	12	E3
The total No. of credits for the Research activity				min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 130, max. 172	

The total No. of credits for Training and Research activities:	min. 25, max. 35	min. 33, max. 46	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 10, max. 20	min. 10, max. 23	min. 168, max. 210	

Module 3 Teaching Activity

(max. 8 credits can be given /semester, a total of min. 0 credit, max. 48 credits)

Course name	Name of department coordinator	Total number of classes (hours)	Requirements	Number of credits in the given semesters								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		
Teaching activity Semesters 1–8 (1 hour/week)	Department of Medical Genetics Prof. Márta Széll	14	OP	2	2	2	2	2	2	2	2		E3
Teaching activity Semesters 1–8 (2 hours/week)	Department of Medical Genetics Prof. Márta Széll	28	OP	4	4	4	4	4	4	4	4		E3
Teaching activity Semesters 1–8 (3 hours/week)	Department of Medical Genetics Prof. Márta Széll	42	OP	6	6	6	6	6	6	6	6		E3
Teaching activity Semesters 1–8 (4 hours/week)	Department of Medical Genetics Prof. Márta Széll	56	OP	8	8	8	8	8	8	8	8		E3
The total No. of credits for the Teaching activity:				0–8	0–8	0–8	0–8	0–8	0–8	0–8	0–8	min. 0 max. 48	

The total No. of credits for the Compulsory training + Research activity + Teaching activity:	min. 0, max. 43	min. 33, max. 54	min. 10, max. 28	min. 10, max. 31	min. 10, max. 28	min. 10, max. 31	min. 10, max. 28	min. 10, max. 31	min. 168, max. 218

Module 4 Publication Activity

a training criterion unrelated to semesters (completion: min. 2 items, min. 65 credits, max. 90 credits)

Name of course	Name of department coordinator	Total number of classes (hours)	Requirements	Number of credits in the given semesters								Total No. of credits	Form of evaluation
				1	2	3	4	5	6	7	8		

English article with no IF (8 hours a week) Semesters 1–8	Department of Medical Genetics Prof. Márta Széll	112	CE	20	20	20	20	20	20	20	20		E3
English article with IF (16 hours a week) Semesters 1–8	Department of Medical Genetics Prof. Márta Széll	224	C	45	45	45	45	45	45	45	45		E3
Poster presentation at a Hungarian event Semesters 1–8	Department of Medical Genetics Prof. Márta Széll	14	CE	3	3	3	3	3	3	3	3		E3
Poster presentation at an international event (Hungary incl.) Semesters 1–8	Department of Medical Genetics Prof. Márta Széll	28	CE	5	5	5	5	5	5	5	5		E3
Oral presentation at a Hungarian event Semesters 1–8	Department of Medical Genetics Prof. Márta Széll	14	CE	3	3	3	3	3	3	3	3		E3
Oral presentation at an international event Semesters 1–8	Department of Medical Genetics Prof. Márta Széll	28	CP	5	5	5	5	5	5	5	5		E3

The total No. of credits for the Publication activity:		**65–81**	

The total No. of credits **in Modules 1–4 modules:** completion of min. 20, max. 45 credits / semester; a total of min. 240 credits / 8 semesters; max. 360 credits / 8 semesters	***min. 233, max. 289**	

A total of min. 240 credits / 8 semesters (7 credits are required to be earned at optional courses, preferably courses offered by the graduate schools of the MSc, which are included in a separate description)

Compulsory subjects (Semesters 1–4)

5. Biostatistics Lecture 28 hours – 6 credits
6. Biostatistics Practice 28 hours – 2 credits

Total No. of credits in Semester 1: 8 credits

3. Computer-assisted research methodology 28 hours – 6 credits
4. Scientific literature 14 hours – 3 credits
5. Biomedical Ethics 14 hours – 3 credits

Total No. of credits in Semester 2: 12 credits

Compulsory subjects related to the PhD subprogram (specialization) (Semesters 1–4)

Subprogram 3: Medical Genetics and Genomics

Clinical Genetics 1 (Semester 2 or 4) 28 hours – 6 credits
Clinical Genetics 2 (Semester 2 or 4) 28 hours – 6 credits

Actualities in human genetics (Semester 2 or 4) 28 hours – 6 credits

Total No. of credits in Semester 4: 18 credits

The training plan consists of 4 parts (modules).

STUDY REQUIREMENTS

General Rules:

- Minimum 18 and maximum 45 credits should be earned in each semester.
- Minimum 90 credits should be earned in Semesters 1–4, min. 90 credits are required for the admission to the complex examination.
- Students should earn minimum 240 credits during the 8 semesters (2 + 2 years).
- For doing teaching activity, 8 credits can be given per semester, up to a total of 48 credits.
- Research report: 3 credits for each; minimum 1 maximum 4 reports can be rewarded by a total of 12 credits.

Requirements for the complex examination:

The complex examination must be completed at the end of Year 2 (Semester 4).
Sum of all compulsory training credits (basic and subprogram (specialization) credits: 20 + 18 = 38 credits)
Compulsory subjects of the 3 subprograms of the Doctoral School of Theoretical Medicine, University of Szeged, of which min. 18 credits must be collected in Semesters 1–4.

Elective subjects (Semesters 1–4)

Compulsory subject 1
Details of the course

Subject area:	Training program of Clinical Genetics and Genomics
Name of course:	**Clinical Genetics 1**
Name of department:	Department of Medical Genetics
Coordinators:	Prof. Marta Széll
Course requirement:	no
Course announcement (Fall or Spring semester)	Spring semester
Suggested course registration:	Semester 2 or 4 (Spring)
Number of classes weekly:	2 classes per week
Total number of classes:	28
No. of credits:	6
Form of evaluation:	End-semester examination

Maximum number of course registrations:	1
Department announcing the course:	1
Type of course:	theoretical /lecture
Type of examination:	oral
Lecturers of the course:	Prof. Dr. Márta Széll, Prof. János Szabó, Dr. Emese Horváth, Dr. Dóra Nagy, Dr. Nikoletta Nagy
* Topics of the course:	1. Genetics in medicine. Human genome. Genome programs, postgenomic era, and new technologies *Prof. Márta Széll* 2. Chromosome anomalies in clinical practice *Dr. Dóra Nagy* *3.* Risk assessment, modern technologies *MTO 1 (lectures 1, 2, and 3)* *Prof. Márta Széll* 4. Multifactorial inheritance. Genetic background of complex diseases, gene-environment interactions *Prof. Márta Széll* *5. Dominant and recessive pattern of inheritance in clinical practice.* *Dr. Dóra Leprán-Török* 6. Teratogenesis. Teratogens in clinical practice. Dymorphology *MTO 2 (lectures 4, 5, and 6)* *Dr. Dóra Leprán-Török* *7.* Pharmacogenetics, pharmacogenomics *Prof. Marta Széll* 8. Gene therapy. Artificial chromosome *Dr. Dóra Nagy* 9. Cancer genetics and genomics *MTO 3 (lectures 7, 8, and 9)* *Prof. István Rasko* 10. Genetic counseling, genetic screening. Ethical considerations. Genetic law. Local aspects in EC, U.S., and Hungary *Dr. Dóra Nagy* 11. The significance of genomic knowledge in the diagnosis, therapy, and prevention of human diseases *MTO 4 (lectures 10 and 11)* *Dr. Zita Borbényi and Dr. Lidia Hategán* *12. Summary. Assessment of the semester* *Prof. Marta Széll*

Required reading (compulsory):	1. Lecture notes. The material necessary for the examinations will be covered in the lectures. (http://www.szote.u-szeged.hu/medgen/) Login details will be available after lectures and changing weekly. 2. Human Genetics. A problem-based approach. Korf BR, 2nd ed, 2000, 2007 3. Thompson and Thompson Genetics in Medicine by Robert L. Nussbaum, M.D. , Ada Hamosh, M.D. (Contributor), Huntington F. Willard, Ph.D., Margaret W. Thompson, Roderick R. McInnes, M.D., Paperback, Elsevier Science Health Science div 2007
Required reading (recommended):	1. SMITH'S: Recognisable patterns of human malformation 2006 2. Emery,s Elements of Medical Genetics. Mueller RF, Young ID, 11th edition, Churchill Livingstone, 2001

Requirements for the successful completion of the course:

Participation in the lectures, successfully passed tests during the semester.

Forms of testing:

a./ MTOs: monthly

b./ Examination at the end of the semester: End-semester examination

Students are required to sign up for, or postpone examinations through the Neptun system.

Compulsory subject 2
Details of the course

Subject area:	Training program of Clinical Genetics and Genomics
Name of course:	**Clinical Genetics 2**

Name of department:	Department of Medical Genetics
Coordinators:	Prof. Marta Széll
Course requirement:	no
Course announcement (Fall or Spring semester)	Spring semester
Suggested course registration:	Semester 2 or 4 (Spring)
Number of classes weekly:	2 classes per week
Total number of classes:	28
No. of credits:	6
Form of evaluation:	End-semester examination
Maximum number of course registrations:	1
Department announcing the course:	1
Type of course:	theoretical /lecture
Type of examination:	oral
Lecturers of the course:	Prof. Dr. Márta Széll, Prof. Dr. Péter Klivényi, Dr. Zsuzsanna László, Dr. Emese Horváth, Dr. Farkas Sükösd, Dr. Dóra Nagy, Dr. Nikoletta Nagy, Dr. Kornélia Tripolszki, Dr. Kata Farkas, Blanka Godza
* Topics of the course:	**Methodology** 1. Cytogenetics: classical karyotyping and fluorescence in situ hybridization 2. Technical approaches: MLPA, array-CGH 3. Technical approaches: PCR, RT-PCR, digital PCR, and Sanger sequencing 4. New generation sequencing: laboratory part 5. New generation sequencing: bioinformatics 6. NIPT test and liquid biopsy **Clinical part:** 7. Structural and numerological chromosome disorders 8. Genodermatosis 9. Neurogenetics 10. Genetics of congenital defects 11. Cystic fibrosis 12. Oncogenetics 13-14. Lectures of students

Required reading:	Peter Turnpenny, Sian Ellard: Emery's Elements of Medical Genetics/Oláh Éva: Klinikai Genetika/hand-out

Compulsory subject 3
Details of the course

Subject area:	Medical genetics and genomics
Name of course:	**Actualities in human genetics**
Name of department:	Department of Medical Genetics
Coordinators:	Prof. Dr. Márta Széll
Course requirement:	not
Course announcement (Fall or Spring semester)	Spring semester
Suggested course registration:	Year 1 or 2
Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	five-grade system
Maximum number of course registrations:	1
Department announcing the course:	Department of Medical Genetics
Type of course:	Lecture
Type of examination:	Written
Lecturers of the course:	Prof. Dr. Márta Széll, Dr. Zsuzsanna László, Dr. Nikoletta Nagy, Dr. Emese Horváth
* Topics of the course:	***"Actualities in human genetics" compulsory course in Medical genetics and genomics education of the Doctoral School of Interdisciplinary Medicine (University of Szeged)*** Genome programs – "update" Dr. Zsuzsanna László (Faculty of Medicine, University of Szeged) The possibilities of personalized medicine – onco-hematology Dr. Zsuzsanna László (Faculty of Medicine, University of Szeged) Genetic diagnostics in the 21st century Dr. Tibor Kalmár and Dr. Zoltán Maróti (Faculty of Medicine, University of Szeged) The importance of extracellular vesicles in intercellular information transfer Dr. Krisztina Búzás (Faculty of Dentistry, University of Szeged and Biological

	Research Centre of the Hungarian Academy of Sciences) Long non-coding RNAs and their role in the human evolution and pathogenesis Prof. Dr. Márta Széll (Faculty of Medicine, University of Szeged) Newly identified mechanism of gene expression regulation Dr. Sára Tóth (Faculty of Medicine, Semmelweis University) Evolutionary aspects of hereditary human diseases Prof. Dr. Csaba Szalai (Faculty of Medicine, Semmelweis University) Epigenetics Dr. Nikoletta Nagy (Faculty of Medicine, University of Szeged) New ethical challenges in clinical genetics Dr. Emese Horváth (Faculty of Medicine, University of Szeged) ”Gene editing” Prof. Dr. Ernő Duda (Faculty of Medicine, University of Szeged and Biological Research Centre of the Hungarian Academy of Sciences) Genetics of human microbiome Prof. Dr. Ernő Duda (Faculty of Medicine, University of Szeged and Biological Research Centre of the Hungarian Academy of Sciences) Possibilities of personalised medicine – solid tumors Prof. Dr. Márta Széll (Faculty of Medicine, University of Szeged) Lectures of the students participating in training (moderator: Prof. Dr. Márta Széll) Lectures of the students participating in training (moderator: Prof. Dr. Márta Széll)
Required reading:	Human Genetics. A problem-based approach. Korf BR, 2nd ed, 2000, 2007 Thompson and Thompson Genetics in Medicine by Robert L. Nussbaum, M.D. , Ada Hamosh, M.D. (Contributor), Huntington F. Willard, Ph.D., Margaret W. Thompson, Roderick R. McInnes, M.D., Paperback, Elsevier Science Health Science div 2007 *Recommended textbooks*: SMITH’S: Recognizable patterns of human malformation 2006

	Emery's Elements of Medical Genetics. Mueller RF, Young ID, 11th edition, Churchill Livingstone, 2001

Requirements for the successful completion of the course:

Participation in the lectures, and successfully passed tests during the semester.

PhD training plan in English for students of the Doctoral School at the University of Szeged, Faculty of Medicine

Basic Module 1/subject credit *(min. 38 credits)*													
Basic module													
Course name	**Name of department coordinator**	**Total number of classes**	**Requirements**	**Number of credits in the given semester**								**Total No. of credits**	**Form of evaluation**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
Computer-assisted research methodology	Department of Medical Physics and Informatics Prof. Dr. Ferenc Peták	28	C	-	6	-	-	-	-	-	-	6	E5
Scientific communication and publication. Methods, rules, and ethics.	Department of Medical Biology Prof. Dr. Ernő Duda	14	C	-	3	-	-	-	-	-	-	3	E5
Biostatistics Lecture	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	6	-	-	-	-	-	-	-	6	E5
Biostatistics Practice	Department of Medical Physics and Informatics Dr. Krisztina Boda	28	C	2	-	-	-	-	-	-	-	2	E3
Biomedical Ethics	Department of Behavioral Sciences Dr. Oguz Kelemen	14	C	-	3	-	-	-	-	-	-	3	E5
The total No. of credits in Basic Module 1				**8**	**12**	**-**	**-**	**-**	**-**	**-**	**-**	**20**	

1 C (Compulsory subject)
2 E (Elective subject)
3 CE (Compulsory elective subject)

Details of the course

	Basic module
Subject area:	PhD day-training for SH students and self-cost students
Course name:	**Computer-assisted research methodology**
Name of department:	Department of Medical Physics and Informatics, Faculty of Medicine, University of Szeged
Coordinator:	Prof. Dr. Ferenc Peták
Course requirement:	-
Course announcement (Fall or Spring semester)	Semester 2 (Spring semester)
Suggested course registration:	Year 1 or 2 of the curriculum
Number of classes weekly:	2
Total number of classes:	28
No. of credits:	6
Form of evaluation:	5-grade system practical examination
Maximum number of course registrations:	2
Department announcing the course:	Department of Medical Physics and Informatics, Faculty of Medicine, University of Szeged
Type of course:	practice
Type of examination:	written
Lecturers of the course:	Prof. Dr. Ferenc Peták, Dr. József Tolnai
Topics of the course:	Basic concepts of data collection and analyses in life sciences (2 lessons) Data processing in life sciences. Preprocessing, data evaluation, sorting and filtering, data manipulation functions, database processing, and the pivot table (10 lessons) Reporting scientific data, scientific graphing, and the use of scientific graphing software (4 lessons) Online scientific databases. Computer systems for manuscript submission, the review and the editorial processes. Introduction to scientometry (2 lessons)

	Presentation of scientific data. Structure and content: their unity to express the message (4 lessons) Handout, manuscript, and theses preparations. Formal requirements, design styles, structure, and content. Introduction to complex, advanced document editing: styles, tables, insertion of images to the text, charts, equations and mathematical formulas. Reference management (6 lessons)
Recommended literature:	- Handouts and syllabus provided at the practical sessions

Informing students on course requirements

(In accordance with the information and study materials available on CooSpace)

From February 2019

Program: PhD day-training for SH students and self-cost students
Course: **Scientific communication and publication. Methods, rules, and ethics.**
Academic year/Semester: **2019/2020, 2**
Educator and contact details (e-mail): **Prof. Ernő Duda duda@brc.hu**
Type of course: **lecture/**seminar/practice/laboratory Lectures Examination date: **17 April 2020.**
Weekly hours of the course: **1** (14 hours)
Credit vale of the course: **3**
Type of examination**:** final examination at the end of the semester, practice examination, other: final written (multiple choice) examination at the end of the semester
Preliminary requirements (preliminary academic performance or completed course required to fulfill the purposes and requirements of the course): **none** (be a PhD student)
Purpose of course: To help students navigate in the (natural) sciences of the 21st century. Planning, execution, and documentation of experiments. Reproducibility, significance of results. Ways and tools of scientific communication. Posters, oral presentations, publications, PhD theses, chapters, books, and patents. Open science, open access, blockchain in science. Peer review, predatory journals, and the impact of publications.

Outcome requirements of the course (specific academic results to be established by the course):

The students should know how to plan and evaluate experiments, how to tell if the results are reproducible, how to document their results, how to communicate their research, how to write a scientific paper, a PhD thesis, when to contact a legal expert to file patents.
They should know where to look for information concerning legal requirements, financial regulations, how to participate in (international) cooperation, how to form consortia, where to find scientific courses, calls for scientific proposals, and how and when to use AI.

Topics:

Data mining
Big data – structured and unstructured big data
Extract data from websites, applications, spreadsheets, IT infrastructure, emails and more
Interpret diverse file naming conversions
Check data for completeness and accuracy
Transform unstructured data automatically into easily digestible reports, tables, or files
Move data and files securely to different locations and users with file transfer automation

AI
Artificial intelligence in medical diagnosis
Artificial Intelligence in Medical Epidemiology
AI in medical (pharmaceutical) research and discovery
Informed, strategic decision making
Natural Language Processing
Machine learning
Deep structured or ”hierarchical” learning

Meta-analysis
Purpose of the research
Working plan, hypothesis
Sample collection, data base
Analysis, validation
Comparison with reference data
Results, publication

Science in the 21st century
Civilization, religion, empirical science
Ancient science, medieval science, development of experimental sciences
Industrial revolution, modern science, trends in the 20th and 21st centuries
Forms and rules of scientific communication
Scientific literature, databases, impact, and citations

Scientific career
Phases of the scientific career
Requirements of success in different phases
World science, collaborations, and networks
Your proposals, your project, and your own team
Know your skills and talents!
Different paths after PhD

Challenges in the 21st century Irreproducible research: mistakes, fabrications, and plagiarism Plagiarism-detecting software, corrections, and retractions Digital age: OCRID, scientist with a number, contribution to a publication Open access: price, importance, advantages and complications, publication of negative results Open access journals, predator journals Electronic notebooks, patents or blockchain? Death of IF
Supporting methods to achieve learning outcomes: Convincing lectures
Evaluation of the acquisition of expected learning outcomes: Evaluation will be in accordance with the purposes and requirements of the course: written examination at the end of the lectures.
Mandatory reading list: none
Recommended reading list: none

Indicating course requirements on CooSpace scene (summary)

Description (public): The course deals with communication and publication of results of experimental sciences. From planning the experiment to the publication of results and discoveries. Forms, means, and ways of correct scientific communication will be discussed.
Requirements: Be familiar with all rules, regulations, tools, and techniques of scientific communication, and know about the challenges of current times.
Topics: Big data, data bases, data mining, IT infrastructure Artificial intelligence in diagnosis, research and discovery Machine learning, ”hierarchical” learning Meta-analysis Forms and rules of scientific communication Scientific career World science, collaborations, networks Publications, success, and challenges in the 21st century

(In accordance with the information and study materials available on CooSpace)

From September 2019

Program: PhD day-training for SH students and self-cost students
Course: **Biostatistics lecture**
Academic year/Semester: 2019/20 Semester 1
Educator and contact details (e-mail): Stéhlik Jánosné Dr. Krisztina Boda boda.krisztina@med.u-szeged.hu Dr. Tibor Nyári nyari.tibor@med.u-szeged.hu Mónika Szűcs szucs.monika@med.u-szeged.hu
Type of course: lecture/seminar/practice/laboratory
Weekly hours of the course: 2
Credit vale of the course: 6
Type of examination: final examination at the end of the semester, practice exam, other:……..
Preliminary requirements (preliminary academic performance or completed course required to fulfill the purposes and requirements of the course):
Purpose of course: The aim of the course is to provide basic practical knowledge of biostatistics, the use and interpretation of the most frequently used basic biostatistical methods used in medical research with the use of a statistical software. With conceptual understanding of data and data collection, we introduce techniques of data processing, representation, and interpretation. We cover topics of trend analysis, use of hypotheses, frequently used statistical tests and their applications. Students will be able to state hypotheses according to the given experimental design, formulate the data base, characterize the distribution of variables according to their type. Students will be familiar with the methods of the most frequently used hypothesis tests, they will be able to find the appropriate methods to test their hypotheses, and interpret the results of computer programs and/or scientific papers.
Topics: 1. **Data description. Types of data, displaying data. Sample characteristics.** (categorical and continuous variables, absolute and relative frequency, bar chart, pie chart, histogram; mean, median, mode, range, quartiles, variance, standard deviation, mean-error chart, and box diagram) 2. **The basics of probability theory.** The concept of probability, rules of probability calculus. Diagnostic tests and conditional probabilities. 3. **Population, statistical sample.** The distribution of categorical and continuous variables, and the density function. Density function, the normal distribution. Statistical estimation, confidence interval. The standard error of mean. The use of Student's t-table

4. **Statistical inference, t-tests** (one sample, paired and independent samples t-test)**.** Significance test by confidence interval, t-statistics, or p-value.
5. **Analysis of variance** (principle of one-way ANOVA, F-test, and pairwise comparisons).
6. **The basics of sample size calculation**. Type I and II errors, statistical power.
7. **Correlation–regression analysis**
8. **The chi-squared test for independence** (assumptions, Fisher exact test)
9. **Nonparametric methods based on ranks** (Wilcoxon test, Mann–Whitney test, Kruskal–Wallis test)
10. **2x2 tables in epidemiology** (Cohen-Kappa, relative risk, and odds ratio), logistic regression
11. **Survival analysis**
12. **The basics of multivariate methods.**

Supporting methods to achieve learning outcomes:

Teaching methods:
Besides giving a theoretical background, we give practical examples based on medical, biological research papers to show the application of the methods in practice. During some lectures, students actually present on the lectures and do home assignments to get bonus points on the final examination.

Evaluation of the acquisition of expected learning outcomes:

Requirements:
Attendance of the lectures is strongly recommended; downloading the lecture slides cannot substitute for the participation at the lecture. The course ends in an end-semester examination.
The lectures are complemented by a practical course the aim of which is to help students reach a deeper understanding of the lecture material.
Examination requirements

- Students failing to meet the requirements of the course cannot take the examination.

The end-semester examination:

- Theoretical part. Students will get a list of topics about the theory and some typical manual calculations. The final examination is a written examination where students will get one topic and some manual calculation problems. Maximum 100 points can be reached on the theoretical part.
- No statistical software will be used on the examination. Students have to sign up for the examination through the Neptun system. Repetition of examinations is according to the general regulations of the Study and the Examination Requirements of the University.
- Practical part: during the practical lessons students may get maximum 100 points based on the two written tests.
- The examination mark consists of two parts: practical part (max. 100 p) + examination part (max. 100 p).

- Core topics: not knowing whether a difference is statistically significant or not on a given level will cause failing the examination (independently of the other knowledge)
- The examination mark is the sum of the points of the theory and practice

Accomplishment, theory+practice, %	Evaluation
0 –50%	failed (1)
51–62.5%	passed (2)
63–75%	accepted (3)
76–87.5%	good (4)
88–100%	excellent (5)

Mandatory reading list:

Students can download course materials (handouts, lecture notes, and R scripts) from the Coospace. Taking notes at the lectures will help in preparing for the examination.

Recommended reading list:

- Michael J. Campbell – David Machin – Stephen J. Walters: Medical Statistics. A Textbook for the Health Sciences (2012) ISBN: 978-1-118-30061-9
- Internet resources:
  Khan Academy: https://www.khanacademy.org/math/statistics-probability
  Crash Course (Statistics):
  https://www.youtube.com/playlist?list=PL8dPuuaLjXtNM_Y-bUAhblSAdWRnmBUcr
  Rice Virtual Lab in Statistics: http://onlinestatbook.com/rvls.html
- Reiczigel Jenő – Harnos Andrea – Solymosi Norbert: Biostatisztika nem statisztikusoknak (2014). Pars Kft. ISBN: 978-963-06-3736-7 (In Hungarian)
- E-learning (in Hungarian): http://eta.bibl.u-szeged.hu/view/creators/Sz==0171cs=3AM=F3nika=3A=3A.html

Indicating course requirements on CooSpace scene (summary)

Description (public):

The aim of the course is to provide basic practical knowledge of biostatistics, the use and interpretation of the most frequently used basic biostatistical methods used in medical research with the use of a statistical software. With conceptual understanding of data and data collection, we introduce techniques of data processing, representation, and interpretation. We cover topics of trend analysis, use of hypotheses, frequently used statistical tests and their

applications. Students will be able to state hypotheses according to the given experimental design, formulate the data base, characterize the distribution of variables according to their type. Students will be familiar with the methods of the most frequently used hypothesis tests, they will be able to find the appropriate methods to test their hypotheses, and interpret the results of computer programs and/or scientific papers.

Evaluation of the acquisition of expected learning outcomes:

Requirements:
Attendance of the lectures is strongly recommended; downloading the lecture slides cannot substitute for the participation at the lecture. The course ends in an end-semester examination.
The lectures are complemented by a practical course the aim of which is to help students reach a deeper understanding of the lecture material.
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- Theoretical part. Students will get a list of topics about the theory and some typical manual calculations. The final examination is a written examination where students will get one topic and some manual calculation problems. Maximum 100 points can be reached on the theoretical part.
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Accomplishment, theory+practice, %	Evaluation
0 –50%	failed (1)
51–62.5%	passed (2)
63–75%	accepted (3)
76–87.5%	good (4)
88–100%	excellent (5)

Topics:

1. **Data description. Types of data, displaying data. Sample characteristics.** (categorical and continuous variables, absolute and relative frequency, bar chart, pie chart, histogram; mean, median, mode, range, quartiles, variance, standard deviation, mean-error chart, and box diagram)
2. **The basics of probability theory.** The concept of probability, rules of probability calculus. Diagnostic tests and conditional probabilities.
3. **Population, statistical sample.** The distribution of categorical and continuous variables, and the density function. Density function, the normal distribution. Statistical estimation, confidence interval. The standard error of mean. The use of Student's t-table
4. **Statistical inference, t-tests** (one sample, paired and independent samples t-test)**.** Significance test by confidence interval, t-statistics, or p-value.
5. **Analysis of variance** (principle of one-way ANOVA, F-test, and pairwise comparisons).
6. **The basics of sample size calculation**. Type I and II errors, statistical power.
7. **Correlation–regression analysis**
8. **The chi-squared test for independence** (assumptions, Fisher exact test)
9. **Nonparametric methods based on ranks** (Wilcoxon test, Mann–Whitney test, Kruskal–Wallis test)
10. **2x2 tables in epidemiology** (Cohen-Kappa, relative risk, and odds ratio), logistic regression
11. **Survival analysis**
12. **The basics of multivariate methods.**

Course description template

Informing students on course requirements

(In accordance with the information and study materials available on CooSpace)

From September 2019

Program: PhD day-training for SH students and self-cost students
Course**: Biostatistics practice**
Academic year/Semester: 2019/20 Semester 1
Educator and contact details (e-mail): Stéhlik Jánosné Dr. Krisztina Boda boda.krisztina@med.u-szeged.hu Dr. Tibor Nyári nyari.tibor@med.u-szeged.hu Mónika Szűcs szucs.monika@med.u-szeged.hu
Type of course: lecture/seminar/practice/laboratory

Weekly hours of the course: **2**

Credit vale of the course: **2**

Type of examination: final examination at the end of semester, practice examination, other: **three-level acceptance**

Preliminary requirements (preliminary academic performance or completed course required to fulfill the purposes and requirements of the course): not

Purpose of course:

The aim of the course is to provide basic practical knowledge of biostatistics, the use and interpretation of the most frequently used basic biostatistical methods used in medical research with the use of a statistical software. With conceptual understanding of data and data collection, we introduce techniques of data processing, representation, and interpretation. We cover topics of trend analysis, use of hypotheses, frequently used statistical tests and their applications. Students will be able to state hypotheses according to the given experimental design, formulate the data base, characterize the distribution of variables according to their type. Students will be familiar with the methods of the most frequently used hypothesis tests, they will be able to find the appropriate methods to test their hypotheses, and interpret the results of computer programs and/or scientific papers.

Topics:

1. **Data description. Types of data, displaying data. Sample characteristics.** (categorical and continuous variables, absolute and relative frequency, bar chart, pie chart, histogram; mean, median, mode, range, quartiles, variance, standard deviation, mean-error chart, and box diagram)
2. **The basics of probability theory.** The concept of probability, rules of probability calculus. Diagnostic tests and conditional probabilities.
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10. **2x2 tables in epidemiology** (Cohen-Kappa, relative risk, and odds ratio), logistic regression
11. **Survival analysis**
12. **The basics of multivariate methods.**

Supporting methods to achieve learning outcomes:

Teaching methods:

Evaluation of the acquisition of expected learning outcomes:

Requirements:
Attendance of the practical is compulsory. Participating in the practical sessions in accordance with the "Study Guide of the Faculty of Medicine". Maximum 3 absences are allowed and at least 50% accomplishment of the course (see below). Students who arrive more than 15 minutes late will be considered absent.
Forms of testing
The students have to perform two tests containing practical problems to be solved by hand calculations and by a computer program (R). During the tests, the use of calculators, computers (without Internet), and own notes on a single A4 sheet are permitted.
Evaluation of the course:
The result of the course is evaluated by a three-grade system. It will be calculated from the points of the tests (maximum 100 points). For a successful accomplishment of the course, the total accomplishment must be at least 50%.
Make-up possibilities:
Make-up tests are possible on the last week. Both tests have to be repeated – except, when one of the tests is above 75%, then only the test with the lower points has to be repeated. In any case, the points of the make-up will be used in the calculation of the final mark.

- Evaluation of the practical is based on the sum of two tests

Accomplishment, practice, %	Evaluation
0 –50%	not met requirements (NOMETRE)
51–90%	met requirements /Passed (METRE/P)t
90%–	met requirements /High mark (METRE/H)

Mandatory reading list:
Students can download course material (handouts, lecture notes, and R scripts) from the Coospace. Taking notes at the lectures will help in preparing for the examination.

Recommended reading list:

- Michael J. Campbell – David Machin – Stephen J. Walters: Medical Statistics. A Textbook for the Health Sciences (2012) ISBN: 978-1-118-30061-9
- Internet resources:
  Khan Academy: https://www.khanacademy.org/math/statistics-probability
  Crash Course (Statistics):
  https://www.youtube.com/playlist?list=PL8dPuuaLjXtNM_Y-bUAhblSAdWRnmBUcr
  Rice Virtual Lab in Statistics: http://onlinestatbook.com/rvls.html
- Reiczigel Jenő – Harnos Andrea – Solymosi Norbert: Biostatisztika nem statisztikusoknak (2014). Pars Kft. ISBN: 978-963-06-3736-7 (In Hungarian)
- E-learning (in Hungarian): http://eta.bibl.u-szeged.hu/view/creators/Sz==0171cs=3AM=F3nika=3A=3A.html

Indicating course requirements on CooSpace scene (summary)

Description (public):

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Make-up possibilities:
Make-up tests are possible on the last week. Both tests have to be repeated – except, when one of the tests is above 75%, then only the test with the lower points has to be repeated. In any case, the points of the make-up will be used in the calculation of the final mark.

- Evaluation of the practical is based on the sum of two tests

Accomplishment, practice, %	Evaluation
0 –50%	not met requirements (NOMETRE)
51–90%	met requirements /Passed (METRE/P)t
90%–	met requirements /High mark (METRE/H)

Topics:

1. **Data description. Types of data, displaying data. Sample characteristics.** (categorical and continuous variables, absolute and relative frequency, bar chart, pie chart, histogram; mean, median, mode, range, quartiles, variance, standard deviation, mean-error chart, and box diagram)
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3. **Population, statistical sample.** The distribution of categorical and continuous variables, and the density function. Density function, the normal distribution. Statistical estimation, confidence interval. The standard error of mean. The use of Student's t-table
4. **Statistical inference, t-tests** (one sample, paired and independent samples t-test)**.** Significance test by confidence interval, t-statistics, or p-value.
5. **Analysis of variance** (principle of one-way ANOVA, F-test, and pairwise comparisons).
6. **The basics of sample size calculation**. Type I and II errors, statistical power.
7. **Correlation–regression analysis**
8. **The chi-squared test for independence** (assumptions, Fisher exact test)
9. **Nonparametric methods based on ranks** (Wilcoxon test, Mann–Whitney test, Kruskal–Wallis test)
10. **2x2 tables in epidemiology** (Cohen-Kappa, relative risk, and odds ratio), logistic regression
11. **Survival analysis**
12. **The basics of multivariate methods.**

Course description template

Informing students on the course requirements

(In accordance with the information and study materials available on CooSpace)

From February 2020

Program: PhD day-training for SH students and self-cost students
Course: **Biomedical ethics**
Academic year/Semester: 2019/2020 Semester 2
Educator and contact details (e-mail): Gergely Tari, tari.gergely.robert@med.u-szeged.hu
Type of course: lecture/seminar/**practice**/laboratory
Weekly hours of the course: 7*2 hours
Credit value of the course: 3 credits
Type of examination: final examination at the end of semester, **practice examination**, other:……..

Preliminary requirements (preliminary academic performance or completed course required to fulfill the purposes and requirements of the course): **not**

Purpose of course:

Bioethics is a rapidly developing field of applied ethics, strongly related to biomedical research. However, advanced medical technologies armor medical professionals with all new diagnostic and curative tools, ethical and legal reflection is often necessary before using them routinely in the daily medical practice. The aim of the course is to present all the bioethical principles (patient autonomy, non-maleficence, beneficence, and justice) to our students as well the international laws that are regulating biomedical research. The course is recommended to all who are somehow involved in scientific research.

Outcome requirements of the course (specific academic results to be established by the course):

Knowledge

- Being familiar with the basic bioethical principles
- Being familiar with the history of ethics of animal research
- Being familiar with the history of ethics of human subject research
- Being familiar with the most important international ethical guidelines regulating the practice of medical professionals and biomedical researchers

Competences

- Having the skill to use appropriate arguments based on sound ethical standards
- Having the skill to recognize ethical dilemmas in the clinical practice
- Having the skills to apply basic bioethical principles to solve moral dilemmas

Attitudes

- Sensitizing our students to favor an attitude in which the most influential norms are patient autonomy, human dignity, and non-discrimination.

Autonomy and responsibility

- Having responsibility to behave according to the standards of modern biomedical ethics and be able to recognize, interpret, and if it is possible, solve ethical dilemmas.

Topics:

1. Introduction to bioethics
2. Basics of human subject research – international ethical and legal approaches
3. Basics of animal experimentation – international ethical and legal approaches
4. Ethical implications regarding human subject research
5. Ethical issues of human reproduction (in vivo and in vitro fertilization)
6. ”Gene-ethics” (CRISPR-Cas9)
7. Practical application of ethical principles of biomedical research (workshop)

Supporting methods to achieve learning outcomes:

Workshops Practicing moral arguments
Evaluation of the acquisition of expected learning outcomes: - Attendance is regulated according to the study and examination rules - The grade is given according to attendance - A written test should be taken by students who have absences
Mandatory reading list: Dr. Kovács József: A modern orvosi etika alapjai. Medicina, Budapest, 2006.
Recommended reading list: Sinaci, M., Sorgner, S.F. (szerk.): Ethics of Emerging Biotechnologies. From Educating the Young to Engineering Posthumans. Trivent Publishing, Budapest, 2018.

Indicating course requirements on CooSpace scene (summary)

Description (public): Bioethics is a rapidly developing field of applied ethics, strongly related to biomedical research. However, advanced medical technologies armor medical professionals with all new diagnostic and curative tools, ethical and legal reflection is often necessary before using them routinely in the daily medical practice. The aim of the course is to present all the bioethical principles (patient autonomy, non-maleficence, beneficence, and justice) to our students as well the international laws that are regulating biomedical research. The course is recommended to all who are somehow involved in scientific research.
Requirements: Knowledge - Being familiar with the basic bioethical principles - Being familiar with the history of ethics of animal research - Being familiar with the history of ethics of human subject research - Being familiar with the most important international ethical guidelines regulating the practice of medical professionals and biomedical researchers Competences - Having the skill to use appropriate arguments based on sound ethical standards

- Having the skill to recognize ethical dilemmas in the clinical practice
- Having the skills to apply basic bioethical principles to solve moral dilemmas

Attitudes

- Sensitizing our students to favor an attitude in which the most influential norms are patient autonomy, human dignity and non-discrimination.

Autonomy and responsibility

- Having responsibility to behave according to the standards of modern biomedical ethics and be able to recognize, interpret and if it is possible solve ethical dilemmas

Evaluation of the acquisition of expected learning outcomes:

- Attendance regulated according to the study and examination rules
- Grade is given according to attendance
- Written test should be written for those students who have absences

Topics:

1. Introduction to bioethics
2. Basics of human subject research – international ethical and legal approaches
3. Basics of animal experimentation – international ethical and legal approaches
4. Ethical implications regarding human subject research
5. Ethical issues of human reproduction (in vivo and in vitro fertilization)
6. ”Gene-ethics” (CRISPR-Cas9)
7. Practical application of ethical principles of biomedical research (workshop)

Supporting methods to achieve learning outcomes:

Workshops
Practicing moral arguments

Mandatory reading list:

Dr. Kovács József: A modern orvosi etika alapjai. Medicina, Budapest, 2006.

Recommended reading list:

Sinaci, M., Sorgner, S.F. (szerk.): Ethics of Emerging Biotechnologies. From Educating the Young to Engineering Posthumans. Trivent Publishing, Budapest, 2018.

SUBJECTS IN THE BASIC MODULE ARE THE SAME IN THE SUBPROGRAM OF EACH DOCTORAL SCHOOL.

Elective Subject

1. **Journal Club** Coordinator Dr Katalin Burian fall and spring semester 14 hours - 3 credit
2. **Features, mechanisms and medical importance of cell death subroutines** Dr Katalin Burian fall and spring semester 28 hours - 6 credit

Subject area:	Medical Microbiology and Immunobiology
Course name:	**Journal Club**
Name of department:	Department of Medical Microbiology and Immunobiolog y
Coordinator:	Katalin Burian
Course requirement:	-
Course announcement (Fall or Spring semester)	fall and spring
Suggested course registration:	continuous
Number of classes weekly:	1
Total number of classes:	14
Credits:	3
Evaluation:	Giving a lecture in the semester, active participation in the discussion every hour. The course is in English, so adequate English language skills are also required
Maximal number of course registrations:	1
Course announcing department:	Department of Medical Microbiology and Immunobiology
Type of course:	Theoretical
Type of exam:	continuous evaluation
Lecturers of the course:	Katlin Burian
Topics of the course:	Students are free to choose an article published in a refereed journal, preferably not older than five years, on a leading topic in the field. The article cannot be a review communication. Based on the chosen article, a 20-35 minute lecture in English will be given, followed by a discussion in English. At the request of the rapporteur, the presentation will be evaluated in writing by the other participants, and the evaluation forms and their summaries will be given to the rapporteur as feedback.
Required reading:	targeted scientific publications downloaded from the PubMed

Subject area:	Medical Microbiology and Immunobiology
Course name:	**Features, mechanisms and medical importance of cell death subroutines**
Name of department:	Department of Medical Microbiology and Immunobiology University of Szeged
Coordinator:	Katalin Burian
Course requirement:	-
Course announcement (Fall or Spring semester)	fall and spring
Suggested course registration:	continuous
Number of classes weekly:	2
Total number of classes:	28
Credits:	6
Maximal number of course registrations:	1
Course announcing department:	Department of Medical Microbiology and Immunobiology
Type of course:	Theoretical
Type of exam:	colloquium
Lecturers of the course:	Klara Megyeri
Topics of the course:	Cell death plays an important role in the pathogenesis of many diseases. Knowledge of the characteristics and mechanisms of cell death is important for a better understanding of the symptoms of various diseases and also for the development of new therapeutic options. The course discusses the features and mechanisms of necrosis, apoptosis, necroptosis, pyroptosis, anoikis, autophagy, and parthanatos. Methods for the detection and characterization of cell death types, such as immunofluorescence, ELISA, TUNEL, cell cycle analysis, Western blot, DNA agarose gel electrophoresis, electron microscopy, are summarized. The course also describes the importance of cell death in bacterial, viral infections, cardiology, neurology, dermatology and immunological processes.
Required reading:	