

UNIVERSITY OF ZAGREB SCHOOL OF MEDICINE

Plan of the course

Medical and Molecular Biology

Academic year **2016/2017**

prof. dr. sc. Floriana Jakuš

I. COURSE AIMS

The course Medical and Molecular Biology is aimed to present to students the basics of the contemporary knowledge about biological processes bearing in mind their medical orientation and their future work in medical practice which is changing and improving in accordance to the scientific progress in biomedical sciences. Therefore modern biological concepts are presented to students in an integrated manner using important medical examples. After mastering this subject, students should be able to follow new trends in biomedical sciences important for full understanding of preclinical and clinical subjects and latest achievements in diagnostics and therapy.

In lectures given by experienced teachers students can learn about the most important old and new biological discoveries and concepts and their significance for human diseases and treatment. A special accent is put on individual work of every student in laboratory exercises where various biological processes as well as modern research methods and diagnostic techniques are presented in order to develop practical skills. In seminars students are encouraged to actively discuss and solve problems related to human diseases.

Medical biology in our medical school traditionally covers cell biology, molecular biology, developmental biology and genetics. Students are learning about the internal organisation of the prokaryotic and eukaryotic cell at its ultrastructural and molecular level and about cellular and molecular interactions in a multicellular organism. The principles and molecular basis of developmental processes (growth, differentiation and morphogenesis) in the embryo and in an adult multicellular organism are addressed as well as the consequences of their deregulation (malformations, cancer). Developmental potential of embryonic cells and their nuclei, embryo transfer, transgenic animals and possibilities of tissue engineering, cell and tissue replacement therapy as well as therapeutical cloning *in vitro* are addressed. Both classical Mendelian and molecular genetics are studied in context of the latest achievements in molecular biology, recombinant DNA technology and genomics (structural and functional). The impact of fundamental research on human gene disorders is addressed (gene mapping, diagnostics, gene therapy, regenerative medicine)

II. COURSE STRUCTURE

Course hours:

Lectures: 30

Seminar: 45

Practicum: 45

Total hours: 120

III. PLAN OF THE COURSE AND COURSE SCHEDULE

BLOCKS OF THE COURSE

Number of blocks: 1

Block number	Start	End
1.	3.10.2016	23.1.2017

BLOCKS OF THE COURSE

Number of blocks: 1

Block number	Start	End
1.	3.10.2016	23.1.2017

BLOCKS OF THE COURSE SCHEME

Block 1

Date	Time	Group	Course hours type	Theme	Teaching staff
Monday 3.10.2016.	09:00-10:30; MEF Biološka	A,B	Lectures	Biology today, molecular biology of the cell	prof. dr. sc. Floriana Jakuš
	10:30-11:15; MEF Biološka	A,B	Lectures	Biology today, molecular biology of the cell	prof. dr. sc. Maja Vlahović
	13:00-15:15; MEF Biologija Praktikum	A	Practicum	Studying the cell (microscopy)	doc. dr. sc. Ana Katušić Bojanac, doc. dr. sc. Nino Sinčić
	17:00-19:15; MEF Biologija Praktikum	B	Practicum	Studying the cell (microscopy)	doc. dr. sc. Ana Katušić Bojanac, doc. dr. sc. Nino Sinčić
Monday 10.10.2016.	09:00-10:30; MEF Biološka	A,B	Lectures	Cell membrane	prof. dr. sc. Maja Vlahović
	10:30-12:00; MEF Biološka	B	Seminar	Prokaryotic and eukaryotic cell	prof. dr. sc. Maja Vlahović
	10:30-12:45; MEF Biologija Praktikum	A	Practicum	Studying the cell (cytology, immunohistochemistry)	doc. dr. sc. Ana Katušić Bojanac, doc. dr. sc. Nino Sinčić
	12:45-15:00; MEF Biologija Praktikum	B	Practicum	Studying the cell (cytology, immunohistochemistry)	doc. dr. sc. Ana Katušić Bojanac, doc. dr. sc. Nino Sinčić
	13:00-14:30; MEF Biološka	A	Seminar	Prokaryotic and eukaryotic cell	prof. dr. sc. Floriana Jakuš
Monday 17.10.2016.	09:00-09:45; MEF Biološka	A,B	Lectures	Internal organization of the cell	prof. dr. sc. Maja Vlahović
	09:45-11:15; MEF Biološka	A	Seminar	Protein sorting, vesicular traffic	prof. dr. sc. Maja Vlahović
	09:45-12:00; MEF Biologija Praktikum	A	Practicum	Studying semipermeability	Anja Kafka, mag. biol. exp., doc. dr. sc. Ana Katušić Bojanac
	12:00-13:30; MEF Biološka	B	Seminar	Protein sorting, vesicular traffic	doc. dr. sc. Nino Sinčić
	12:00-14:15; MEF Biologija Praktikum	B	Practicum	Studying semipermeability	Anja Kafka, mag. biol. exp., doc. dr. sc. Ana Katušić Bojanac
Monday 24.10.2016.	08:45-11:00; MEF Biologija Praktikum	B	Practicum	Erythrocytes, white ghosts	izv. prof. dr. sc. Ljiljana Šerman, izv. prof. dr. sc. Tamara Nikuševa-Martić
	09:00-09:45; MEF Biološka	A,B	Lectures	Organelles, energy conversion	prof. dr. sc. Maja Vlahović
	09:45-12:00; MEF Biološka	A	Seminar	The cytoskeleton	prof. dr. sc. Maja Vlahović
	12:00-14:15; MEF Biologija Praktikum	A	Practicum	Erythrocytes, white ghosts	izv. prof. dr. sc. Ljiljana Šerman, izv. prof. dr. sc. Tamara Nikuševa-Martić
	12:00-14:15; MEF Biološka	B	Seminar	The cytoskeleton	prof. dr. sc. Maja Vlahović
Monday 31.10.2016.	08:00-10:15; MEF Kompjutorska učionica	B	Seminar	Transcription, reverse transcription, translation	prof. dr. sc. Floriana Jakuš

Date	Time	Group	Course hours type	Theme	Teaching staff
	08:00-10:15; MEF Biologija Praktikum	A	Practicum	DNA isolation, electrophoresis, blots (nucleic acids, proteins)	izv. prof. dr. sc. Tamara Nikuševa- Martić, izv. prof. dr. sc. Ljiljana Šerman
	10:15-12:30; MEF Biološka	A	Seminar	Transcription, reverse transcription, translation	prof. dr. sc. Maja Vlahović
	10:15-12:30; MEF Biologija Praktikum	B	Practicum	DNA isolation, electrophoresis, blots (nucleic acids, proteins)	izv. prof. dr. sc. Tamara Nikuševa- Martić, izv. prof. dr. sc. Ljiljana Šerman
	13:00-13:45; MEF Biologija Praktikum	A,B	Lectures	From DNA to proteins, the central dogma of molecular biology, DNA replication	prof. dr. sc. Floriana Jakuš
Monday 7.11.2016.	08:30-09:30; MEF Biološka	SVI	Exam	B1 EXAM	prof. dr. sc. Nives Pećina-Šlaus, Anja Kafka, mag. biol. exp., doc. dr. sc. Ana Katušić Bojanac, izv. prof. dr. sc. Ljiljana Šerman, doc. dr. sc. Nino Sinčić, prof. dr. sc. Floriana Jakuš
	08:30-09:30; MEF Mašek	SVI	Exam	B1 EXAM	izv. prof. dr. sc. Tamara Nikuševa- Martić, prof. dr. sc. Maja Vlahović
	09:30-11:00; MEF (C) - Šercer	A,B	Lectures	The cell cycle and programmed cell death, regulation	prof. dr. sc. Maja Vlahović
	11:00-13:15; MEF Biologija Praktikum	B	Practicum	Phases of the cell cycle (interphase, mitosis)	izv. prof. dr. sc. Ljiljana Šerman, izv. prof. dr. sc. Tamara Nikuševa-Martić
	13:15-15:30; MEF Biologija Praktikum	A	Practicum	Phases of the cell cycle (interphase, mitosis)	izv. prof. dr. sc. Ljiljana Šerman, izv. prof. dr. sc. Tamara Nikuševa-Martić
	Monday 14.11.2016.	09:00-10:30; MEF Biološka	A,B	Lectures	Biology of the reproduction, Early embryonic development
10:30-12:45; MEF Biologija Praktikum		A	Practicum	Meiosis, gametogenesis, fertilization	izv. prof. dr. sc. Ljiljana Šerman, izv. prof. dr. sc. Tamara Nikuševa-Martić
10:30-12:00; MEF Biološka		B	Seminar	Biology of the reproduction	prof. dr. sc. Floriana Jakuš
12:45-15:00; MEF Biologija Praktikum		B	Practicum	Meiosis, gametogenesis, fertilization	izv. prof. dr. sc. Ljiljana Šerman, izv. prof. dr. sc. Tamara Nikuševa-Martić
13:00-14:30; MEF Biološka		A	Seminar	Biology of the reproduction	doc. dr. sc. Ana Katušić Bojanac
Monday 21.11.2016.	09:00-10:30; MEF Wickerhauser	A,B	Lectures	Early development, morphogenesis, induction	prof. dr. sc. Floriana Jakuš
	10:30-12:45; MEF Biologija Praktikum	B	Practicum	Cleavage, embryo transfe	doc. dr. sc. Ana Katušić Bojanac, doc. dr. sc. Nino Sinčić
	10:30-12:00; MEF Wickerhauser	A	Seminar	Transgenic organisms	prof. dr. sc. Floriana Jakuš

Date	Time	Group	Course hours type	Theme	Teaching staff
	12:45-15:00; MEF Biologija Praktikum	A	Practicum	Cleavage, embryo transfe	doc. dr. sc. Ana Katušić Bojanac, doc. dr. sc. Nino Sinčić
	13:00-14:30; MEF Wickerhauser	B	Seminar	Transgenic organisms	izv. prof. dr. sc. Tamara Nikuševa- Martić
Monday 28.11.2016.	09:00-10:30; MEF Biološka	A,B	Lectures	Genetics of developmental processes	prof. dr. sc. Floriana Jakuš
	10:30-12:45; MEF Biološka	B	Seminar	Inductive interactions, critical phases of the mammalian development	doc. dr. sc. Ana Katušić Bojanac
	10:30-12:45; MEF Biologija Praktikum	B	Practicum	Developmental stages, experimental in vitro models of development	doc. dr. sc. Nino Sinčić, Anja Kafka, mag. biol. exp.
	12:45-15:00; MEF Biologija Praktikum	A	Practicum	Developmental stages, experimental in vitro models of development	doc. dr. sc. Nino Sinčić, Anja Kafka, mag. biol. exp.
	13:00-15:15; MEF Biološka	A	Seminar	Inductive interactions, critical phases of the mammalian development	prof. dr. sc. Floriana Jakuš
Monday 5.12.2016.	09:00-10:30; MEF Biološka	A,B	Lectures	Genetics, Mendelian and Molecular	prof. dr. sc. Nives Pećina-Šlaus
	10:30-12:00; MEF Biološka	B	Seminar	Differentiation, differential gene activity	doc. dr. sc. Ana Katušić Bojanac
	10:30-12:00; MEF Biologija Praktikum	A	Seminar	Differentiation, differential gene activity	doc. dr. sc. Nino Sinčić
Monday 12.12.2016.	09:00-09:45; MEF Biološka	A,B	Lectures	Independent assortment, X-linkage	prof. dr. sc. Nives Pećina-Šlaus
	09:45-12:45; MEF Biološka	A	Seminar	Phenotype, genotype, patterns of inheritance	prof. dr. sc. Maja Vlahović
	09:45-12:00; MEF Biologija Praktikum	B	Practicum	Differentiated cells	doc. dr. sc. Nino Sinčić, Anja Kafka, mag. biol. exp.
	12:00-15:00; MEF Mašek	B	Seminar	Phenotype, genotype, patterns of inheritance	izv. prof. dr. sc. Ljiljana Šerman
	12:45-15:00; MEF Biologija Praktikum	A	Practicum	Differentiated cells	doc. dr. sc. Nino Sinčić, Anja Kafka, mag. biol. exp.
Wednesday 14.12.2016.	08:00-11:00; MEF Kompjutorska učionica	B	Seminar	Monogenic and polygenic human disorder	izv. prof. dr. sc. Tamara Nikuševa- Martić
	11:00-12:30; MEF Mašek	A,B	Lectures	Genomics (human and other genomes), recombinant DNA technology	prof. dr. sc. Floriana Jakuš
	13:00-16:00; MEF Kompjutorska učionica	A	Seminar	Monogenic and polygenic human disorder	izv. prof. dr. sc. Ljiljana Šerman
Tuesday 20.12.2016.	10:00-10:45; MEF Biološka	A,B	Lectures	Genetics of prokaryotes, biotechnology	prof. dr. sc. Floriana Jakuš
	14:30-16:45; MEF Biologija Mikroskopirnica 2	A	Practicum	Human DNA fingerprinting	izv. prof. dr. sc. Tamara Nikuševa- Martić, izv. prof. dr. sc. Ljiljana Šerman
	16:45-19:00; MEF Biologija Praktikum	B	Practicum	Human DNA fingerprinting	izv. prof. dr. sc. Tamara Nikuševa- Martić, izv. prof. dr. sc. Ljiljana Šerman

Date	Time	Group	Course hours type	Theme	Teaching staff
Wednesday 21.12.2016.	08:30-09:30; MEF Biološka	SVI	Exam	B2 EXAM	doc. dr. sc. Nino Sinčić, prof. dr. sc. Nives Pećina-Šlaus, izv. prof. dr. sc. Tamara Nikuševa-Martić, doc. dr. sc. Ana Katušić Bojanac, prof. dr. sc. Maja Vlahović, prof. dr. sc. Floriana Jakuš
	08:30-09:30; MEF Mašek	SVI	Exam	B2 EXAM	izv. prof. dr. sc. Ljiljana Šerman, Anja Kafka, mag. biol. exp.
	12:00-13:30; MEF Kompjutorska učionica	B	Seminar	Linkage and recombination, recombinant DNA technology	izv. prof. dr. sc. Tamara Nikuševa-Martić
	14:30-15:15; MEF Biologija Mikroskopirnica 2	A	Seminar	Human DNA fingerprinting (results)	doc. dr. sc. Ana Katušić Bojanac
	16:15-17:00; MEF Biologija Praktikum	B	Seminar	Human DNA fingerprinting (results)	izv. prof. dr. sc. Tamara Nikuševa-Martić
	16:15-17:45; MEF Nova vijećnica	A	Seminar	Linkage and recombination, recombinant DNA technology	izv. prof. dr. sc. Ljiljana Šerman
Thursday 22.12.2016.	13:30-14:15; MEF Nova vijećnica	A,B	Lectures	Mutations, molecular mechanisms	prof. dr. sc. Nives Pećina-Šlaus
	14:30-16:45; MEF Biologija Mikroskopirnica 2	B	Practicum	Bacterial transformation	izv. prof. dr. sc. Tamara Nikuševa-Martić, izv. prof. dr. sc. Ljiljana Šerman
	16:45-19:00; MEF Biologija Praktikum	A	Practicum	Bacterial transformation	izv. prof. dr. sc. Tamara Nikuševa-Martić, doc. dr. sc. Ana Katušić Bojanac
Friday 23.12.2016.	09:30-11:00; MEF Mašek	A,B	Lectures	Control of gene expression	prof. dr. sc. Maja Vlahović
	14:30-16:45; MEF Biologija Praktikum	A	Practicum	Bacterial transformation, results, chromosomes, cytogenetics	Anja Kafka, mag. biol. exp., doc. dr. sc. Ana Katušić Bojanac
	14:30-16:00; MEF Biološka	B	Seminar	Procaryotic and eukaryotic gene	prof. dr. sc. Maja Vlahović
	16:45-19:00; MEF Biologija Praktikum	B	Practicum	Bacterial transformation, results, chromosomes, cytogenetics	Anja Kafka, mag. biol. exp., izv. prof. dr. sc. Ljiljana Šerman
	16:45-18:15; MEF Biološka	A	Seminar	Procaryotic and eukaryotic gene	doc. dr. sc. Ana Katušić Bojanac
Monday 9.1.2017.	09:00-09:45; MEF Biološka	A,B	Lectures	Molecular biology of cancer	prof. dr. sc. Maja Vlahović
	09:45-12:00; MEF Biologija Praktikum	A	Practicum	Experimental tumorigenesis, teratoma, teratocarcinoma	doc. dr. sc. Nino Sinčić, Anja Kafka, mag. biol. exp.
	09:45-12:00; MEF Biološka	B	Seminar	Molecular Biology in Medicine	prof. dr. sc. Maja Vlahović
	12:00-14:15; MEF Biološka	A	Seminar	Molecular Biology in Medicine	izv. prof. dr. sc. Tamara Nikuševa-Martić

Date	Time	Group	Course hours type	Theme	Teaching staff
	12:15-14:30; MEF Biologija Praktikum	B	Practicum	Experimental tumorigenesis, teratoma, teratocarcinoma	doc. dr. sc. Nino Sinčić, Anja Kafka, mag. biol. exp.
Tuesday 10.1.2017.	08:30-10:45; MEF Biologija Praktikum	B	Practicum	Primary culture, subcultivation	Anja Kafka, mag. biol. exp., doc. dr. sc. Ana Katušić Bojanac
	09:15-10:45; MEF Kompjutorska učionica	A	Seminar	Genetic and epigenetic mechanisms of tumorigenesis	doc. dr. sc. Nino Sinčić
	10:45-13:00; MEF Biologija Praktikum	A	Practicum	Primary culture, subcultivation	Anja Kafka, mag. biol. exp., doc. dr. sc. Ana Katušić Bojanac
	10:45-12:15; MEF Biološka	B	Seminar	Genetic and epigenetic mechanisms of tumorigenesis	izv. prof. dr. sc. Ljiljana Šerman
	13:00-13:45; MEF Biološka	A,B	Lectures	Gene therapy	prof. dr. sc. Floriana Jakuš
Wednesday 11.1.2017.	09:00-09:45; MEF Biološka	A,B	Lectures	Cloning	prof. dr. sc. Floriana Jakuš
	10:00-11:30; MEF Mašek	A	Seminar	Cell culture	prof. dr. sc. Floriana Jakuš
	10:00-11:30; MEF Wickerhauser	B	Seminar	Cell culture	doc. dr. sc. Ana Katušić Bojanac
Thursday 12.1.2017.	09:00-11:15; MEF Nova vijećnica	A	Seminar	Mammalian cloning, ethical considerations	prof. dr. sc. Floriana Jakuš
	09:00-11:15; MEF Wickerhauser	B	Seminar	Mammalian cloning, ethical considerations	doc. dr. sc. Nino Sinčić
	11:30-13:00; MEF Wickerhauser	A,B	Lectures	Molecular biology, genomics, proteomics and the future of medicine	prof. dr. sc. Floriana Jakuš
	13:00-15:15; MEF Nova vijećnica	A	Seminar	Regenerative medicine. Mapping of the human genome, structural and functional genomics	doc. dr. sc. Nino Sinčić
	13:00-15:15; MEF Kompjutorska učionica	B	Seminar	Regenerative medicine. Mapping of the human genome, structural and functional genomics	prof. dr. sc. Maja Vlahović
Monday 16.1.2017.	09:00-10:00; MEF Biološka	SVI	Exam	B3 EXAM	izv. prof. dr. sc. Tamara Nikuševa-Martić, izv. prof. dr. sc. Ljiljana Šerman, doc. dr. sc. Nino Sinčić, Anja Kafka, mag. biol. exp., prof. dr. sc. Maja Vlahović, prof. dr. sc. Floriana Jakuš
	09:00-10:00; MEF Mašek	SVI	Exam	B3 EXAM	prof. dr. sc. Nives Pećina-Šlaus, doc. dr. sc. Ana Katušić Bojanac
Monday 23.1.2017.	09:00-10:00; MEF Mašek	SVI	Exam	EXAM	prof. dr. sc. Nives Pećina-Šlaus, doc. dr. sc. Ana Katušić Bojanac
	09:00-10:00; MEF Biološka	SVI	Exam	EXAM	doc. dr. sc. Nino Sinčić, prof. dr. sc. Floriana Jakuš

Date	Time	Group	Course hours type	Theme	Teaching staff
Tuesday 27.6.2017.	09:00-10:00; MEF Biološka	SVI	Exam	EXAM	izv. prof. dr. sc. Ljiljana Šerman, izv. prof. dr. sc. Tamara Nikuševa-Martić
Tuesday 11.7.2017.	09:00-10:00; MEF Biološka	SVI	Exam	EXAM	prof. dr. sc. Maja Vlahović, doc. dr. sc. Nino Sinčić
Tuesday 5.9.2017.	09:00-10:00; MEF Biološka	SVI	Exam	EXAM	prof. dr. sc. Nives Pećina-Šlaus, doc. dr. sc. Ana Katušić Bojanac

Lectures and seminars will take place in halls Šalata 3.

Practicals will take place at the Department of Biology.

IV. EXAMINATIONS

A. Examination: Written and oral

Written exam is divided in three compulsory multiple-choice tests, taking place during the course (B1, B2, and B3). After the course, students may take exams (multiple-choice tests) which they failed and after passing must take the oral exam. Once passed, any part or whole written examination needs not to be taken again except when the student refuses the final grade at the oral examination.

B.Types of examination and examination dates

1) Obligatory partial multiple-choice tests or partial exams (B1, B2, B3) during the course

a) 07.11.2016. B1

b) 21.12.2016. B2

c) 16.01.2017. B3

2) Multiple-choice and final oral exam

23.01.2017

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Regular terms

Date

Winter

23.01.2017.

Summer

27.06.2017.

11.07.2017.

Autumn

05.09.2017.

19.09.2017.

V./I. LIST OF LECTURERS AND TEACHING STAFF

1. prof. dr. sc. Floriana Jakuš

2. prof. dr. sc. Maja Vlahović
3. prof. dr. sc. Nives Pećina-Šlaus
4. izv. prof. dr. sc. Ljiljana Šerman
5. izv. prof. dr. sc. Tamara Nikuševa-Martić
6. doc. dr. sc. Ana Katušić Bojanac
7. doc. dr. sc. Frane Paić
8. doc. dr. sc. Nino Sinčić
9. Anja Kafka, mag. biol. exp.

V./II EXTERNAL ASSOCIATES:

V./III UNTENURED LECTURERS:

VI. LITERATURE

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01. G.M.Cooper, Hausman R.E. 7th ed (2016): The Cell, a Molecular Approach, ASM Press, Sinauer Associates, Washington DC, Sunderland, Massachusetts

B. Additional

01. B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter (2008) : Molecular Biology of the Cell, Fourth Edition, Garland Publishing, Inc., New York & London

02. P. Turnpenny, S. Eliard (2012): Emery's Elements of Medical Genetics, 14th Edition, Churchill Livingstone, Edinburgh, London, New York, selected chapters

NOTE: Consultations are held by all lecturers and assistants every Monday for 1 hr after the last session