University: University of Presov	
Faculty/university workplace: Faculty of Humanities and Natural Sciences	
Code: 2BIO/EROSJCYTZ/22	**Course title:** Cytogenetics

Type, scope and method of educational activity:
Type of educational activity: Lecture, Laboratory
Scope of educational activity: 2,1 hour per week, 26,13 per semester
Method of educational activity: Attendance

Number of credits: 5

Recommended semester:

Spring	Biology

Study grade: Master

Prerequisites:

Conditions for passing the course:
Form of assessment:

Continuous evaluation:
To successfully complete the course, active participation in lectures and seminars is mandatory. A student can have a maximum of 2 absences justified on the basis of a medical certificate. In case of absence, the student will receive substitute tasks, or undergo consultations. In case of unjustified absence or a large number of absences, the student will not be granted credits. Within the seminars, it is necessary to develop a seminar project on a predetermined topic and present it in the form of a PowerPoint presentation in the range of 10-15 minutes. The conditions for passing the course is to gain at least 70% of points from the test in the 3rd week of the semester, which verifies the basic knowledge of general genetics, necessary for understanding the lectures of the course and submitting laboratory protocols from exercises. The course will be evaluated based on an oral exam in the range of lectures, seminars and recommended literature.
Success criteria: A: 100.00 – 90.00%, B: 89.99 – 80.00%, C: 79.99% - 70.00%, D: 69.99 % - 60.00 %, E: 59.99 % - 50.00 %. FX: 49.99 % and less %.
Final evaluation:
Exam

Learning outcomes:
Knowledge gained:
The student will be able to:
- define and interpret in own words the basic concepts in the field of cytogenetics,
- characterize the phases of mitosis and meiosis and describe the differences between them,
- describe in their own words the morphology and structure of the eukaryotic chromosome at all levels,
- classify the basic types of chromosome aberrations and describe their causes and consequences,
- describe the different forms of sex determination in plants and animals and give examples of species and/or taxonomic groups,
- define and interpret in their own words the terms genomic imprinting and X-inactivation,
- explain in their own words the basic mechanisms of chromosome evolution,
- list the basic differences in the karyotype of humans and higher primates,
- describe specific and extreme karyotypes and atypical chromosome types and give examples of

organisms in which they have been described.
Skills Acquired:
The student will be able to:
- describe a recorded karyotype and identify any aberrations,
- perform basic work in the cytogenetics laboratory associated with cell culture, chromosome staining and preparation of slides
- prepare a seminar project on a specified topic and present it in the form of a PowerPoint presentation in the range of 10 - 15 minutes.
Competences acquired:
The student:
- can creatively solve problems, point out the causes of problems, propose solutions,
- is able to demonstrate a high degree of independence in the application of methods used in comparative cytogenetics.

Course content:
• Introduction to cytogenetics. The morphology of eukaryotic chromosomes.
Cell cycle. Cell division. Spermatogenesis and oogenesis.
• Karyotype. Terminology. Karyotypes of plants, animals and humans. Atypical ch. (Holocentric ch., Minich. Lampbrush ch., Polyethylene ch. And B-ch.)
• Numerical chromosomal aberrations. The mechanism and consequences.
Structural chromosomal aberrations. The mechanism and consequences.
• Chromosomal sex determination. X chromosome inactivation. The emergence of sex chromosomes. Genomic imprinting.
• Evolution of chromosomes. Comparative Cytogenetics.
• Specific adaptation in cytogenetics of microorganisms, plants and animals. Model organisms in cytogenetics.
• Polyploidy. Mosaic, chimeras and hybrids.
Exercises:
• Traditional methods of cytogenetic analysis: cell culture and banding techniques (practical exercises).
• CGH (theoretical seminar).
• FISH - basics of fluorescence microscope (practical exercises).
• Flow cytometry (practical exercises).

Recommended literature :
Roy: Cytogenetics. 2009, ISBN-13: 978-1842654873
MacGregor, J. M.: An introduction to animal cytogenetics.1993, ISBN-13: 978-0412546006
Fan Y.-S.: Molecular Cytogenetics: Protocols and Applications (Methods in Molecular Biology). 2010, ISBN-13: 978-1617373008

Notes:

Course evaluation:
Total number of students evaluated:

A	B	C	D	E	FX

Lecturers:
prof. RNDr. Jarmila Bernasovská, PhD., guarantor
ass. Prof. RNDr. Dana Dojčáková, PhD., co-guarantor, lecturer, examiner, instructor, seminary supervisor

Date of last change: 01.09.2022

Approved by: prof. RNDr. Jarmila Bernasovská, PhD.