

**Course Information Sheet** (in the structure according to Decree No. 614/2002 Coll.)

<b>University:</b> University of Prešov in Prešov	
<b>Faculty:</b> Faculty of Humanities and Natural Sciences	
<b>Code:</b> 2BIO/EROSJCYTG/25	<b>Title of Course:</b> Cytogenetics
<b>Type, scope and method of educational activities:</b> Compulsory course	
<b>Form of Study:</b> Lecture, Laboratory exercise	
<b>Number of contact hours:</b> 2/2	
<b>per week:</b> 2/2 <b>per level/semester:</b> 26/26	
<b>Study method:</b> combined	
<b>Student load: 150 hours</b>	
Direct education: 39 hours	
Self-study: 50 hours	
Preparation for the interim assessment: 22 hours	
Guided work: 39 hours	
<b>Number of credits:</b> 5	
<b>Semester:</b> 2 <sup>nd</sup>	
<b>Degree/Level:</b> 2 <sup>nd</sup>	
<b>Prerequisites:</b>	
<b>Grading Policy (Assessment/Evaluation):</b> Exam	
To successfully complete the course, active participation in lectures and laboratory exercises 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. 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 %.	
<b>Aims and Objectives:</b>	
<b>Acquired knowledge:</b>	
<ul style="list-style-type: none"><li>• Describe and explain the basic principles of cytogenetics, including eukaryotic chromosome morphology and cell cycle</li><li>• Explain the principles of chromosome sex determination, X chromosome inactivation and genomic imprinting</li><li>• Clarify the mechanisms of numerical and structural chromosome aberrations and discuss their phenotypic consequences</li><li>• Characterize chromosome evolution and explain the principles of comparative cytogenetics</li><li>• Explain the importance of cytogenetics in medicine and its role in genetic counseling</li></ul>	
<b>Acquired skills:</b>	
<ul style="list-style-type: none"><li>• Analyze and interpret karyotypes of various organisms (plants, animals, humans) including recognition of numerical and structural aberrations</li><li>• Interpret the results of basic laboratory methods of cytogenetic analysis (e.g. banding techniques, CGH, FISH, flow cytometry)</li><li>• Independently prepare cytogenetic preparations and evaluate the results of microscopic and molecular-cytogenetic analyses</li></ul>	
<b>Acquired Competencies:</b>	

- Identify and interpret basic genetically determined pathological conditions from a cytogenetic perspective
- Discuss the phenotypic consequences of chromosome aberrations and their medical significance
- Integrate knowledge from molecular and classical cytogenetics in solving biological and medical problems
- Demonstrate independence in performing cytogenetic analyses and interpreting their results

**Syllabus/Indicative Content:**

- Introduction to cytogenetics. Cell cycle. Cell division.
- Morphology and structure of eukaryotic chromosome.
- Karyotype. Karyotyping, cytogenetic nomenclature. Karyotypes of plants, animals and humans. Atypical chromosomes.
- Mutations, mutagenesis. Numerical and structural chromosome aberrations. Mechanism of origin, types and consequences.
- Chromosomal sex determination. X chromosome inactivation. Genomic imprinting.
- Polyploidy. Mosaic, chimera and hybrid.
- Chromosome evolution. Comparative cytogenetics.
- Specific adaptations in cytogenetics of microorganisms, plants and animals.
- Cytogenetic examination methods: Classical and modern methods of cytogenetic analysis: cell culture and banding techniques, CGH, FISH, flow cytometry Human cytogenetics. Subject, methods and division of human genetics. Clinical cytogenetics and its importance, genetically determined pathological conditions, genetic counseling.
- Investigation methods in human cytogenetics. Oncocytogenetics. Prevention of genetic pathological conditions, detection of genetic carriers, genetic screening. Prenatal diagnostics.

**Suggested readings:**

- Boroňová I., Bernasovská J., 2015. Genetika a cytogenetika človeka. 1. vyd., Prešovská univerzita v Prešove, 189 s., ISBN 978-80-555-1466-6.
- Boroňová I., 2015. Cytogenetika človeka – chromozómová analýza. 1. vyd., Prešovská univerzita v Prešove, 78 s., ISBN 978-80-555-1513-7.
- Bernasovská J., Boroňová I., 2015. Genetika, cytogenetika, genomika. 1. vyd., Prešovská univerzita v Prešove, 183 s., ISBN 978-80-555-1482-6. ISCN, 2013.
- An International System for Human Cytogenetic Nomenclature: Recommendations of the International Standing Committee on Human Cytogenetic Nomenclature, 1. edition, S. Karger, 140 p., ISBN 978-3-318-02253-7.
- Sršeň, Š., Sršňová, K., 2000. Základy klinickej genetiky a jej molekulárna podstata. Osveta, Martin, 410 s., ISBN 80 - 85824- 04-3.
- Thompson, J.S., Thompsonová, M.W., 2004. Klinická genetiká. Nakladateľstvo Triton, 6. vydanie, Praha, 426 s.
- Roy: Cytogenetics. 2009, ISBN-13: 978-1842654873
- MacGregor, J. M.: An introduction to animal cytogenetics. 1993, ISBN-13: 978-0412546006
- Kočárek E. a kol.: Klinická cytogenetika I. 2006, ISBN 80-246-1069-8
- Kočárek E.: Praktická cvičení z klinické cytogenetiky. 2006, ISBN 80-246-1070-1

**Language of Instruction:** Slovak language

**Other course information:**

**Grading history**

A	B	C	D	E	FX

**Lecturer/Instructor:**

doc. RNDr. Dana Dojčáková, PhD. lecturer, examiner, trainer, laboratory exercise leader

doc. RNDr. Iveta Boroňová, PhD. lecturer, examiner, trainer, laboratory exercise leader
---

<b>Last update:</b> 20. April 2026
------------------------------------

<b>Approved by:</b> prof. RNDr. Jarmila Bernasovská, PhD., guarantor
--