Module syllabus: ***Molecular Cytogenetics***

1. Overall information

Module coordinator	Dr Agnieszka Braszewska-Zalewska, Department of Plant Anatomy and Cytology
Contact	abraszew@us.edu.pl, phone: 322009553
ECTS	**5**
Method for the verification of learning outcomes	The final grade for the module is weighted on the average of the following student activities: - Active participation in practicals (Continuous evaluation of knowledge, activity and practical skills) (0.3) - Written final exam (0.7) To be awarded a final grade, a student must pass each activity within the module. Grades: 51% and less – fail (**F**); 52-60% – with minimum academic criteria (**E**); 61-75% – satisfactory (**D**); 76-85% – good (**C**); 86-90% – very good (**B**), 91% and more – excellent (**A**)

2. Description of student activity and work

Lecture	
Responsible instructor	Professor Robert Hasterok, Department of Plant Anatomy and Cytology
Content	**The main objective of this module** is to acquaint students with selected topics of molecular cytogenetics. **Lectures** comprise the core subjects on comparative genome analyses, chromosomal rearrangements and genome polyploidisation and diploidisation events. **Lecture content:** Basic methods of molecular cytogenetics – Fluorescence *in situ* hybridisation (FISH) and its various modifications. Molecular cytogenetics in phylogenetic studies. Endopolyploidy in plant development. Practical use of molecular cytogenetics methods in medicine and plant breeding.
Number of didactic hours (contact hours)	**15**
Literature	Jenkins G., Maluszynska J., Schweizer D. (eds). 2001. Advanced molecular cytogenetics – a practical course manual. Wydawnictwo Uniwersytetu Śląskiego, Katowice. Jenkins G., Hasterok R. 2007. BAC 'landing' on chromosomes of *Brachypodium distachyon* for comparative genome alignment. Nature Protocols 2: 88-98. Maluszynska J. 2002. *In situ* hybridization in plants – methods and application. In:

	Molecular techniques in crop improvement, edited by SM Jain. Kluwer Academic Publishers Schwarzacher T., Heslop-Harrison J.S. 2000. Practical *in situ* hybridization. BIOS Scientific Limited.

Laboratory	
Responsible instructors	Dr Agnieszka Brąszewska-Zalewska, Dr Maja Orzechowska, Dr Aleksander Betekhtin Department of Plant Anatomy and Cytology
Laboratory projects	Practical 1-2: Chromosome preparation procedures Practical 3: Southern blot Practical 4: Fluorescence *in situ* hybridisation (FISH) Practical 5: Immunocytochemical detection of DNA and histone epigenetic modifications Practical 6: Fluorescence microscopy – analysis of the results
Methodology of laboratory classes	Experiments will be performed in small groups under the supervision of an instructor and will include: • Designing and accomplishing the procedure • Calculating and presenting the results • Preparing a report • Protocol commitment and presentation
Number of didactic hours (contact hours)	**45**
Literature	Maluszynska J. 2002. *In situ* hybridization in plants – methods and application. In: Molecular techniques in crop improvement, edited by SM Jain. Kluwer Academic Publishers Schwarzacher T., Heslop-Harrison J.S. 2000. Practical in situ hybridization. BIOS Scientific Limited. Fuchs J, Demidov D, Houben A, Schubert I. 2006. Chromosomal histone modification patterns – from conservation to diversity. Trends in Plant Science 11: 199-208. Braszewska-Zalewska A, Wolny EA, Smialek L, Hasterok R (2013) Tissue-specific epigenetic modifications in root apical meristem cells of *Hordeum vulgare*. PLoS ONE 8: e69204.

3. Forms of verification

Continuous evaluation of knowledge, activity and practical skills	
Grades	Grades are awarded on a scale of A-F, where A is excellent and F is a fail. Excellent performance (A) – the student actively participates in the laboratory

	work, demonstrates an excellent understanding of the experimental procedures (their aims, sequence and outcomes), is independent and creative in solving current problems and in assessing and presenting the experimental results. The student is competent to perform experiments using the methods of molecular cytogenetics. The student knows how to use a fluorescence microscope. Very good performance (B) – the student actively participates in the laboratory work, demonstrates a very good understanding of the experimental procedures (their aims, sequence and outcomes), is independent in solving current problems and in assessing and presenting the experimental results. The student is competent to perform experiments using the methods of molecular cytogenetics. Good performance (C) – the student demonstrates good judgment and knowledge, correctly conducts an experiment, correctly exhibits a sense of the experimental procedure, properly assesses and presents the experimental results. The student knows how to plan experiments in the field of molecular cytogenetics. Satisfactory performance (D) – the student demonstrates satisfactory judgment and knowledge, is poorly engaged and needs additional assistance to finish the experiment and assess the final of the experimental results correctly, presents a satisfactory presentation of the experimental results. The student is familiar with the basic and advanced techniques of molecular cytogenetics but is not competent enough to perform the experiments independently. With minimum academic criteria (E) – the student is poorly engaged in the laboratory work and needs additional assistance to finish the experiment. The student is familiar with the basic techniques of molecular cytogenetics but is not competent enough to perform the experiments independently. Performance that does not meet the minimum academic criteria (F) – the student is not engaged in the experiments, does not exhibit a sense of the experimental procedures, poorly interprets and presents the experimental results. The student is not familiar with the basic and advanced techniques of molecular cytogenetics.

Written final exam	
Grades	Grades are awarded on a scale: A-F, where A is excellent and F is failing. Excellent (A) – the student presents fluent knowledge of the organisation of the nuclear genome and molecular cytogenetics methods, makes minimal errors that do not affect the overall quality of the exam. Very good (B) – the student presents very good knowledge of the organisation of the nuclear genome and molecular cytogenetics methods, makes minimal errors that do not affect the overall quality of the exam. Good (C) – the student presents good knowledge of the organisation of the nuclear genome and molecular cytogenetics methods, makes rare and minor errors. Satisfactory (D) – the student exhibits satisfactory knowledge but with a poor understanding of the mechanisms of the organisation of the nuclear genome and makes frequent and moderate errors. With minimum academic criteria (E) – the student exhibits poor knowledge

	and does not understand most of the mechanisms of the organisation of the nuclear genome, makes frequent errors. Fail (F) – the student does not present satisfactory knowledge of the organisation of the nuclear genome and makes many major errors, which disqualify their exam.

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