Subject Area: **Advanced Methods in Biotechnology and Biodiversity**
Subject: **Advanced Molecular Cytogenetics**
Level: **III-PhD** Year: **I-IV** Semester***:*** **1-2**
Speciality: **N/A** Status: **Facultative** ECTS: **3**
Department: **Plant Anatomy and Cytology**
Cooperating Department: **N/A**

Form of teaching (Number of hours; Form of assessment: Exam or Credit)

Lectures	*Seminars/Conversatoria*	*Practicals*	*Total*
4		**26**	**30**

Staff:

SUBJECT COORDINATOR: Prof. Robert Hasterok Ph.D.
LECTURE/CONVERSATORIA: Prof. Robert Hasterok Ph.D.

Contents:

LECTURES:

Application of various molecular cytogenetic methods (FISH, GFP, CGH) in plant breeding and medicine.

PRACTICALS:

During the practicals the following molecular cytogenetics techniques will be introduced to the students:

- fluorescence *in situ* hybridisation (FISH) with various repetitive DNA (rDNA, centromeric, telomeric, retrotransposon etc.) sequences as a tool to study plant nuclear genome structure.
- genomic *in situ* hybridisation (GISH) as a tool to study phylogeny of natural and resynthesized allopolyploids.
- FISH with BAC clones as a tool to obtain chromosome-specific markers and study fine scale evolution of nuclear genomes.
- flow and imaging cytometry.
- digital image acquisition and analysis, interpretation of results and their preparation for publication in research paper.

Methods and forms of teaching:

Lectures illustrated by computer presentations and video projector.

Requirements: Knowledge of cytogenetics and molecular biology at the basic level.

Literature *(maximum 5 sources, all in English)*:

1. Jenkins G, Hasterok R, 2007, BAC landing on chromosomes of *Brachypodium distachyon* for comparative genome alignment. *Nature Protocols* 2: 88-98
2. Lysak M, Fransz P, Schubert I, 2006, Cytogenetic analyses of *Arabidopsis*, pp. 173-186. In: *Methods in Molecular Biology* 323, edited by J. Salinas and J.J. Sanchez-Serrano. Humana Press Inc., Totowa, NJ
3. Maluszynska J, 2002, *In situ* hybridization in plants - methods and application, pp. 299-326. In: *Molecular techniques in crop improvement*, edited by S.M. Jain. Kluwer Academic Publishers.
4. Schwarzacher T, Heslop-Harrison JS, 2000, *Practical in situ hybridization*. BIOS Scientific Limited.
5. Volpi EV, Bridger JM, 2008, FISH glossary: an overview of the fluorescencje *in situ* hybridization technique. *Biotechniques* 45: 385-409.

Remarks *(if necessary):* the practicals will require one week. The maximal number of students in the practical group is six.