Course code	Course group	Volume in ECTS credits	Course hours
BIO6010	C	6	160

Course type (compulsory or optional)	**Compulsory**
Course level (study cycle)	**Master**
Semester the course is delivered	**Autumn**
Study form (face-to-face or distant)	**Face-to-face**

Course title in Lithuanian

AUGALŲ BIOTECHNOLOGIJA

Course title in English

PLANT BIOTECHNOLOGY

Short course annotation in Lithuanian

Kurso metu nagrinėjamas augalų biotechnologijos svarba žmogui ir gamtos išsaugojimui. Aiškinami morfogenezės *in vitro* keliai, sėkmingo mikrodauginimo sąlygos, augalų antrinių metabolitų gavimo bioreaktoriuose pasiekimai ir problemos, galimybės ir būdai keisti reakcijos į stresą genų raišką. Nagrinėjama molekulinių žymenų reikšmė identifikuojant genus ir kartografuojant genomus. Išklausę kursą magistrantai sugebės kurti, tobulinti ir taikyti augalų biotechnologijos metodus.

Short course annotation in English

Importance of plant biotechnology to human health and nature preservation analyze during the course. Morphogenesis routes *in vitro*, achievements and problems of micropropagation, production of secondary metabolites in bioreactors, expression of genes related to stress are explained. Use of molecular markers for gene identification and gene mapping of different crops are discussed. After finishing the course students will be able to develop, optimize and apply methods of plant biotechnology.

Prerequisites for entering the course

To hear courses of biology, genetics, biophysics required.

Course aim

The aim of the course is to study theoretical background, achievements and applications of plant biotechnology.

Links between course outcomes and criteria of learning achievement evaluation

Course outcomes	Criteria of learning achievement evaluation
Understand the principles plant biotechnology	knows development periods of plant biotechnology, links of plant biotechnology to plant genetics, genomics, proteomics and system biology.
To show applications of plant biotechnology	presents examples of successful solving problems in agriculture, human health preservation, nutrition improvement using plant biotechnology methods.
Design an experiment of plant micropropagation	presents plant taxa, suitable for successful micropropagation, ways to achieve desirable morphogenetic effect, knows methods to increase output of plants and solve vitrification and rooting problems.

Control of plant regeneration from isolated cells and tissues	presents the peculiarities of plant cell structures, crucial for isolation of protoplasts, knows requirements for successful plant regeneration.
Implement of pest and disease free plant material growing system *in vitro*	knows principles of plant resistance to biotic and abiotic stress, distinguish plant injury symptoms, evaluation methods, resistance genes and ways to improve resistance by biotechnological means.
Manage of bioinformatics methods	can design primers and apply methodology of molecular markers for identification of plant genes, polymorphism studies and gene mapping.

Content (topics)

1. Development of plant biotechnology, its importance to human life, agriculture and nature preservation.
2. Plant growth, nutrition, propagation and plant biotechnology.
3. Plant cell structure peculiarities, important for plant biotechnology.
4. Plant morphogenesis *in vitro*.
5. Growing of isolated protoplasts and plant regeneration.
6. Plant micropropagation and its applications.
7. Plant biological engineering.
8. Plant secondary metabolites and bioreactors.
9. Plant resistance to biotic and abiotic factors and biotechnology.
10. Molecular markers, identification of genes and genotyping.
Practical work (contents): Evaluation of cold hardines of *Fragaria*, *Pyrus*, *Malus* and *Miscanthus* plants *in vitro*, micropropagation of strawberry (*Fragaria*), isolation of strawberry protoplasts and its viability evaluation, plant genotyping, interpretation of SSR analysis results, plant preparation for cryopreservation and long term storage.

Distribution of workload for students (contact and independent work hours)

Lectures – 45 hours, laboratory work– 15 hours, examination – 3 hours, individual work – 97 hours.

Structure of cumulative score and value of its constituent parts

Final assessment sums the assessments of written final examination (50%), written mid-term examination (20%) and assessment of laboratory works (30%).

Recommended reference materials

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	*Self-study rooms*	*Other libraries*
Basic materials						
1.	2005	Sliesaravičius, A ir *Stanys*, V. Žemės ūkio *augalų biotechnologija*.	Vilnius, Enciklopedija	10		
2.	2004	Christou P., Klee H. Handbook of Plant Biotechnology Slater J. A., Scott N., Fowler M. Plant Biotechnology: The Genetic Manipulation of Plants.	Wiley and Sons Ltd Oxford University Press			2
Supplementary materials						

1.	2004	Nguyen H. T., Blum A. Physiology and biotechnology integration for plant breeding.	Marcel Dekker
2.	2002	Oksman-Caldentey K-M., Barz W.H. Plant biotechnology and transgenic plants	Marcel Dekker
3.	2007	Shetty K., Paliyath G., Pometto A.L., Levin R.E. Functional foods and biotechnology.	Taylor and Francis

Course programme designed by

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