Course title:	In vitro cultures – universal plant research platform
Course title in Polish:	Kultury in vitro – uniwersalna platforma badawcza roślin
Course for discipline:	agriculture and horticulture, forest sciences

Semester:	4	**Status of course:**	faculty	**Language:**	english
Academic year:	2026/27	**Catalog number:**	39/2025/26		

Coordinator of course:	dr hab. Andrzej Pacholczak, prof. SGGW
Lecturer od course:	dr hab. Andrzej Pacholczak, prof. SGGW
Executing unit:	Section of Ornamental Plants
Ordering unit:	Doctoral School SGGW
Assumptions, goals and description of the course:	The subject is focused on the use of in vitro plant cultures as a universal research tool in life sciences (for example, in horticulture, agriculture, and forestry). In vitro cultures are an perfect tool for plant breeding, the production of elite propagation material and secondary metabolites in bioreactors, and even for use in endangered species conservation. The classes also take into account aspects of sustainable development, including modern lighting technologies (LED-light) - presentation of the possibility of using LED light in the in vitro laboratories, reducing the energy consumption of processes, and ecological alternatives to traditional growth regulators (e.g. biostimulators). The students learn about the characteristics and action of natural growth regulators and their potential use in the in vitro cultures. The course also includes setting up experiments in this area.
Didactic form, number of hours:	15 hours
Teaching methods:	Presentations, work in the in vitro laboratory
Limit of people in the group:	6

Learning outcomes

KNOWLEDGE - the graduate knows and understands:	**SKILLS - the graduate is able to:**	**COMPETENCES - the graduate is ready to:**
To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	Critically evaluate the achievments in the field/discipline represented
Major general development trends in the field/discipline		Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect
		Support the ethos of scientific circles and conduct independent research

The method of verification of learning outcomes:	Effect SD1_KW01, SD1_KW02, SD1_KU05, SD1_KK01, SD1_KK03, SD1_KK08 – presentation by a PhD student, report on the experiment conducted Effect SD1_KU05, SD1_KK01, SD1_KK03 – activity/discussion during the class
Form of documentation of achieved learning outcomes:	presentation by a PhD student (case study), report on the experiment conducted
Elements and weights of the final grade:	Presentation and report on the experiment conducted - 80%, activity/discussion during class - 20%. A maximum of 100 points can be obtained for each element. The condition for passing the course is to obtain from element 1 and 2 min. 51%.
Place of the course:	lecture classroom and laboratory of in vitro plant cultures

Basic and supplementary literature

Pasternak T., Steinmacher D., 2024. Plant Growth in Cell and Tissue Culture In Vitro. Plants, 13(2), 327.
Pawłowska B., Żupnik M., Cioć M., 2018. Impact of LED light sources on morphogenesis and levels of photosynthetic pigments in Gerbera jamesonii grown in vitro. Horticulture, Environment, and Biotechnology, 59: 115-123.
Phillips G., Garda M., 2019. Plant tissue culture media and practices: an overview. In Vitro Cellular & Developmental Biology-Plant, 55: 242-257.
Park Y., Runkle E., 2018. Spectral effects of light-emitting diodes on plant growth, visual color quality, and photosynthetic photon efficacy: White versus blue plus red radiation. PLoS One 13(8).
Reshi Z., Husain F., Khanam M., Javed S., 2025. Effect of meta-topolin on morphological physiochemical, and molecular dynamics during in vitro regeneration of Salix tetrasperma Roxb. BMC Plant Biology, 25, 121.
Zenkteler M., Zenkteler E., 2013. 65 years of in vitro culture in Poland. Acta Societatis Botanicorum Poloniae 82(3): 183–192.
Articles in a journal Plant Cell, Tissue and Organ Culture (PCTOC) - Springer Link.

Comments:	

Estimated number of hours of work of the doctoral student necessary to achieve the assumed learning outcomes:	

Leraning outcomes reference to the second degree characteristics of the National Qualification Framework (level 8) covering doctoral competences:

Symbol:	**Learning outcomes:**	**8 level NQF**
SD1_KW01	To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	P8S_WG
SD1_KW02	Major general development trends in the field/discipline	P8S_WG

SD1_KU05	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	P8S_UW
SD1_KK01	Critically evaluate the achievments in the field/discipline represented	P8S_KK
SD1_KK03	Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect	P8S_KK
SD1_KK08	Support the ethos of scientific circles and conduct independent research	P8S_KR