SYLLABUS

Name of the course (as specified in the approved curriculum) Module 9 – Sustainable Fish Farming			Number of ECTS credits **5**
Name of the course in Polish Moduł 9 – Zrównoważona Produkcja Ryb			
Unit providing the course Department of Zoology			
Course co-ordinator dr inż. Mateusz Rawski			
Field of study Animal Production Management	Level II – master studies	Profile Academic-general	Semester 3

TYPE OF CLASSES AND COURSE LOAD
(Classes with teacher and student's own work)

Mode of studies: full-time		Mode of studies: part-time	
- lectures	15	- lectures	-
- classes	30	- classes	-
- field classes	10	- field classes	-
- labs	0	- labs	-
- consultations	5	- consultations	-
- student's own work	60	- student's own work	-
- others	5	- others	-
Total number of hours:	125	Total number of hours:	-

OBJECTIVE OF THE COURSE

The impact of fisheries management on the natural environment. Methods to reduce the negative impact of intensive harvesting of oceans. Alternative sources of protein in fish nutrition are used in sustainable production.

TEACHING METHODS

Lectures: presentations using multimedia equipment.
Classes: supported by multimedia presentation, laboratory exercises, discussion, team-oriented tasks, and written assignments. Preparation of a project verified by the teacher.
Field classes are conducted at the Experimental Station for Feed Production Technology and Aquaculture in Muchocin.

	Course learning outcomes	The reference to the study field learning outcomes
Knowledge	O1: using RAS (Recirculating Aquaculture Systems) in modern fish farming, purifying and reusing water in a closed system, minimizing water consumption and the risk of disease without the use of antibiotics; O2: implementation of aquaponics, integrating fish farming with plant cultivation, where fish waste serves as a natural fertilizer for plants; O3: biofloc technology, the use of beneficial bacteria (probiotics) that process organic waste directly in the tank, remediation, and biological mechanisms in water treatment; O4: aquaculture automation, sensors and systems for monitoring water quality, optimizing feed dosing, and detecting early signs of disease; O5: introducing certification in aquaculture, markings guaranteeing the ethical origin of the product and compliance with welfare principles;	AP2A_W02 AP2A_W09 AP2A_W11 AP2A_W13

Skills	O6: search, critically analyze, and interpret information from literature, databases and other sources related to sustainable aquaculture, present this knowledge and communicate with various stakeholders in oral, written, and graphical form; O7: fluently use scientific literature in sustainable aquaculture and discuss these topics with fish farmers using foreign congress language according to the requirements set out for the B2+ level of the Common European Framework of Reference for Languages, with particular reference to vocabulary in the field of sustainable aquaculture; O8: optimizing aquaculture feeding processes, using innovative feeds, and reducing reliance on fishmeal to reduce pollution and environmental impact; minimizing impact on habitats, selecting appropriate locations for fish farming, and protecting natural ecosystems; O9: managing production and energy resources in aquaculture, using renewable energy sources (solar panels, wind turbines) and energy-efficient devices (e.g., variable-speed pumps); O10: ensuring appropriate conditions for aquaculture animal rearing, providing adequate space for living and feeding; reducing the use of antibiotics and chemicals, using autoimmune protection and probiotics instead of antibiotics to prevent bacterial resistance and environmental pollution; O11: monitoring of water quality parameters and fish health; compliance with regulations, water intake and discharge permits, and veterinary supervision systems;	AP2A_U01 AP2A_U02 AP2A_U05
Social competences	O12: lifelong learning and updating the cognitive skills, as well as to inspire and organize the learning process of other people; to demonstrate a creative attitude; to think and act in an entrepreneurial way; O13: take the ethical and social responsibility for the effects of the activities in aquaculture production with particular reference to domestic fish species; O14: assess the risk of the aquaculture impact, personal threats, and the safety of colleagues and the environment; O15: take the ethical and social responsibility for the effects of the production of high-quality food from aquaculture, and undertake the entrepreneurial and creative actions in this respect;	AP2A_K01 AP2A_K03 AP2A_K04 AP2A_K05

Methods for verifying learning outcomes	Symbols of course learning outcomes
Lectures – written test	O1 – O15
Practical classes – individual tasks, discussions	
Phased project	

TEACHING CONTENTS

Lectures:

Inland aquaculture: development prospects, historical evolution, and the current status of production; recent scientific advancements. Examination of technologies and systems employed in the cultivation and breeding of various aquatic species. Water pollution and eutrophication: key challenges and their effects within pond culture systems. Principles of conservation aquaculture, including fish stocking, restocking, and the safeguarding of wild fish populations.

Classes:

Design and operational management of aquaculture facilities. Evaluation of water quality: chemical and physical parameters, with an overview of testing methods and interpretation of results. The impact of aquaculture practices on aquatic ecosystems, such as mangrove forests and cage systems. Water treatment techniques, including filtration and conditioning, used in recirculating systems. Approaches to minimizing the environmental footprint of aquaculture activities.

Forms and criteria of completing the course	Percentage of a final grade
Lectures: Attendance, a multiple-choice test.	50%
Classes: Attendance, individual tasks assigned by the tutors, phased project.	50%

LITERATURE LIST

Core literature

T.V.R. Pillay, M.N. Kutty (1997). Aquaculture Principles and Practices. Blackwell Publishing.
Available online: https://www.academia.edu/38025550/AQUACULTURE_PRINCIPLES_AND_PRACTICES
Hepher B. (1988). Nutrition of Pond Fishes. Cambridge University Press.
C.D. Webster, C.E. Lim (2002). Nutrient Requirements and Feeding of Finfish for Aquaculture. CABI Publishing.

Additional sources

C. E. Nash. The history of aquaculture. Blackwell Publishing Ltd. USA, 2011. Available online: https://bumtca.com.ua/wp-content/uploads/Colin_Nash_The_History_of_AquacultureBookFi.org-2_copy_copy-1.pdf
Williot, P., Nonnotte, G., & Chebanov, M. (Eds.). (2018). *The Siberian Sturgeon (Acipenser baerii, Brandt, 1869) Volume 1-Biology*. Springer International Publishing.
Williot, P., Nonnotte, G., & Chebanov, M. (Eds.). (2018). *The Siberian Sturgeon (Acipenser baerii, Brandt, 1869) Volume 2-Farming*. Springer International Publishing.
Review articles recommended by the teachers related to aquaculture.