Course guide
390340 - POA - Aquatic Organism Production

Last modified: 03/06/2024

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 745 - DEAB - Department of Agri-Food Engineering and Biotechnology.

Degree: BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: MARIA LOURDES REIG PUIG

Others: Segon quadrimestre:
MARIA LOURDES REIG PUIG - 6GSB1, 6GSB2
Ramirez Rodriguez, Maria Saray

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Technology for aquatic organisms production.

Transversal:
2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

TEACHING METHODOLOGY

With the whole group, the general objectives of the course are introduced through a brief exposition, developing the basic concepts of the subject. Through practical exercises the teacher tries to motivate and engage students to participate actively in their learning . It uses Support material is used, in the form of a detailed syllabus by ATENEA including: learning objectives in each topic, specific contents examples, programming and evaluation activities autonomous learning and related literature. With the small group, other activities are performed: problem-solving sessions related to the specific learning objectives of the course content, lab sessions that allow to develop basic skills instrumental , as well as initiate students in the application of the scientific method and case studies to enable developing critical analysis and application of concepts.

Typically, after each session specific tasks are proposed outside the classroom, which must be dealt well individually or in groups. The hours of autonomous learning are dedicated to studying, reading and problem solving oriented cases.

LEARNING OBJECTIVES OF THE SUBJECT

After completing the course Production of aquatic organisms, the student should be able to describe the characteristics of the aquaculture sector and identify its various applications. The student will be also able to identify the elements that make a particular species interesting for aquaculture, understand their biological characteristics and their implications for the production. He/she will be able to understand the determinants of production in the aquatic environment and define the main parameters of water quality with relevance to the production, understanding their dynamics and their interactions and relating the adaptive mechanisms of aquatic species and its implication for production. The student will describe appropriate facilities for the production of aquatic organisms. Finally the student will learn to use appropriate technical management criteria for the production of aquatic organisms that take into account the animal welfare and the environmental sustainability. The technical management of crop is revised in two groups, differentiating between organisms that require exogenous food (fish and shellfish) and those that are fed feed directly from the environment (molluscs and algae).

STUDY LOAD

Type	Hours	Percentage
Hours large group	40,0	26.67
Self study	90,0	60.00
Hours small group	20,0	13.33

Total learning time: 150 h

CONTENTS

INTRODUCTION TO AQUATIC ORGANISMS PRODUCTION

Description:
In this topic both the characteristics of the aquaculture sector and the aquatic environment are dealt, as well as the implications of production in aquatic environments

Related activities:
ActivitY 1: Lectures
Activity 6: Search of data from production and markets of the major cultured species

Full-or-part-time: 16h
Theory classes: 2h
Laboratory classes: 2h
Self study : 12h

INTERESTING ORGANISMS: CRITERIA AND MAIN CHARACTERISTICS

Description:
In this topic the main criteria to select species for aquaculture are analyzed. The characteristics that make a species an interesting candidate for aquaculture are revised.

Related activities:
Activity 1: Lectures
Activity 4: Necropsy and recognition of aquatic organisms

Full-or-part-time: 18h
Theory classes: 6h
Laboratory classes: 2h
Self study : 10h

WATER QUALITY CRITERIA FOR AQUATIC PRODUCTION

Description:
This content covers the relationship between the main water parameters of interest in aquaculture and the adaptive response of aquatic organisms. Specifically the relationship between temperature and poikilothermia, salinity and osmoregulation, dissolved oxygen and respiration, pH and mineral balance and nitrogen compounds and nitrogen excretion. Other water parameters and/or compounds are also presented.

Related activities:
Activity 1: Lectures
Activity 4: Routine management in an aquaculture facility (water quality control, fish biometry)
Activity 5: Estimation of dissolved oxygen and water flow requirements in a fish facility

Full-or-part-time: 30h
Theory classes: 8h
Laboratory classes: 4h
Self study : 18h

FACILITIES FOR AQUATIC ORGANISMS PRODUCTION

Description:
The content of this topic describes the general features of the various types of aquaculture facilities (general characteristics and site selection). After this introduction the land-based facilities and the open sea facilities are analyzed, including the elements in each type: water uptake, hydraulic circuit, types of tanks and water treatment in the land-based, and anchoring and floating systems in the open-sea systems. Facilities for algae production (open and closed reactors) are also analyzed.

Related activities:
Activity 1: Lectures
Activity 2: Avaluació dels continguts
Activity 5: Design of facilities.
Activity 7: Technical visit to a closed-circuit facility (Aquarium) (optional)

Full-or-part-time: 30h
Theory classes: 8h
Laboratory classes: 4h
Self study : 18h

PRODUCTION MANAGEMENT (FISH AND CRUSTACEAN)

Description:
This topic deals with the general overview of the production cycle in an aquaculture facility devoted to the production of organisms that depend on an active contribution of exogenous feeding (fish and shellfish - crustaceans). We review the various sections of importance in production: breeding, incubation and live food production, nutrition and feeding, monitoring of the stock evolution (growth management), health, interaction with the environment and quality of aquatic products

Related activities:
Activity 1: Lectures
Activity 3: Estimation of the evolution of the fish stock

Full-or-part-time: 34h
Theory classes: 10h
Laboratory classes: 4h
Self study : 20h

PRODUCTION MANAGEMENT (MOLLUSCS AND ALGAE)

Description:
In this topic, the production of organisms that can grow upon the food provided by the environment is revised (molluscs and algae). Regarding the production of molluscs, seed collection, suspended and inland cultures are overviewed. Regarding the production of algae, the differences in the production of micro and macroalgae are analyzed. The production cycle in a microalgae facility is described in further detail, emphasizing the control of water quality and the evolution of the stock (continuous or batch production)

Related activities:
Activity 1: Lectures
Activity 2: avaluació dels continguts
Activity 4: Live food production: phytoplankton and Artemia.
Activity 7: Technical visit related with the topic (Agròpolis, bioreactor for wastewater treatment)

Full-or-part-time: 22h
Theory classes: 6h
Laboratory classes: 4h
Self study : 12h

ACTIVITIES

(ENG) ACTIVITAT 1: CLASSES D'EXPLICACIÓ

(ENG) ACTIVITAT 2: PROVES INDIVIDUALS D'AVALUACIÓ

(ENG) ACTIVITAT 3: PRÀCTIQUES EN AULA INFORMÀTICA

(ENG) ACTIVITAT 4: PRÀCTIQUES DE LABORATORI

(ENG) ACTIVITAT 5: PRÀCTIQUES DE RESOLUCIÓ DE PROBLEMES I CASOS

(ENG) ACTIVITAT 6: ÚS SOLVENT DE RECURSOS DE INFORMACIÓ

(ENG) ACTIVITAT 7: SORTIDES RELACIONADES AMB L'ASSIGNATURA

GRADING SYSTEM

The final exam includes questions about concepts associated with the learning objectives of the course, with regard to knowledge or understanding, and a set of application exercises. The subject includes an intermediate with the same format. The two exams (intermediate and final) have different weight in the final grade (30 and 70%, respectively).
Continuous assessment includes the deliverables described in the various practical activities, both individually and in group. Its rating is the average of the activities.

The final score is the sum of the following partial grades:
N1: grade assessment exams
N2: continuous assessment (practical activities)
CG: generic skill
Nfinal: Final Grade

Nfinal = 0,6 N1 + 0,25 N2 + 0,15 CG

EXAMINATION RULES.

- If any of the activities is not done, the student will have to develop an alternative activity according to the teacher.
- The work must always be submitted by the deadline. Otherwise it won't be accepted.
- In the activities that are performed in pairs or groups, all members will receive the same grade. If there's any problem inside the pair or group, the teacher should be informed before the evaluation of the related deliverable.
- If a student cannot follow the work plan, it must be notified to the teacher in order to organize an alternative work plan involving the same dedication.

BIBLIOGRAPHY

Basic:
- Beaumont, A.R. Biotechnology and genetics in fisheries and aquaculture [on line]. Oxford: Blackwell Science, 2003 [Consultation: 17/11/2022]. Available on: https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9781444318791. ISBN 0632055154.
- Belaud, A. Oxygénation de l'eau: en aquaculture intensive. Toulouse: Cépaduès-Éditions, 1995. ISBN 2854283503.
- Boyd, C.E. Pond aquaculture water quality management. Boston: Kluwer Academic Publishers, 1998. ISBN 0412071819.
- FAO. Integrated agriculture-aquaculture: a primer. Roma: FAO, 2001. ISBN 9251045992.
- Huguenin, J.E. Design and operating guide for aquaculture seawater systems [on line]. Amsterdam: Elsevier, 1992 [Consultation: 22/12/2022]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/bookseries/developments-in-aquaculture-and-fisheries-science/vol/33/suppl/C. ISBN 0444871578.
- Jobling, M. Fish bioenergetics. London: Chapman & Hall, 1994. ISBN 041258090X.
- Lawson, T.B. Fundamentals of aquacultural engineering [on line]. New York: Chapman & Hall, 1995 [Consultation: 22/12/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6494347. ISBN 0412065118.
- Midlen, A.B. Environmental management for aquaculture. London: Chapman & Hall, 1998. ISBN 0412595001.
- Timmons, M.B. Aquaculture water reuse systems: engineering design and management. Amsterdam: Elsevier, 1994. ISBN 044489585X.
- Beveridge, Malcolm C.M. Cage aquaculture [on line]. 2nd ed. Oxford: Fishing News Books, 1996 [Consultation: 15/07/2022]. Available on: https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9780470995761. ISBN 0852382359.
- Iwama, G.K. Fish stress and health in aquaculture. Cambridge: Cambridge University Press, 1997. ISBN 9780521281706.
- Barnabé, G. Aquaculture [Recurs electrònic] : biology and ecology of cultured species [on line]. Hempstead: Taylor & Francis, 2005 [Consultation: 12/07/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/reader.action?docID=179014. ISBN 9780203168837.

Complementary:
- Avnimelech, Yoram. Biofloc Technology : a practical guidebook. Third edition. Baton Rouge, La.: World Aquaculture Society, [2015]. ISBN 9781888807226.