Course guide
250591 - ENGPROAQUI - Engineering in Aquaculture Projects

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 745 - DEAB - Department of Agri-Food Engineering and Biotechnology.
Degree: BACHELOR'S DEGREE IN MARINE SCIENCE AND TECHNOLOGY (Syllabus 2018). (Optional subject).
Academic year: 2022  ECTS Credits: 6.0  Languages: Spanish

LECTURER

Coordinating lecturer: INGRID MASALO LLORA
Others: EDUARDO DE NEIRA ARIAS, INGRID MASALO LLORA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
13388. To know and apply the lexicon and concepts of the Marine Sciences and Technologies and other related fields.
13390. Establish a good practice in the integration of common numerical, laboratory and field techniques in the analysis of any problem related to the marine environment.
13395. To set, evaluate and propose solutions to the different conflicts of use and exploitation in the marine and coastal environment resources based on scientific and technical criteria.
13399. Apply the state-of-the-art numerical and statisticat techniques in the coastal and marine fields for a correctly interpretation of data. (Specific competence of the Marine Technologies Mention)
13402. Use and apply indicators to assess impacts, both natural and anthropogenic, and propose corrective measures with monitoring and surveillance programs. (Specific competence of the Marine Technologies Mention)
13403. Develop a conceptual framework to address the sustainability of the marine environment and the related socio-economic activities at different scales, explaining the effects of climate change.
13404. Set, plan and execute basic and applied research in the field of Marine Sciences and Technologies.
13405. Carry out calculations, assessments, surveys and inspections in coastal and marine environments, as well as the corresponding technical documents.
13406. Write technical reports and disseminate knowledge about the different components of the marine system, considering the applicable legal framework.
13407. Apply the necessary tools to analyze the economic and legal aspects of human actions and the related impacts on the marine environment, including technical advice and representation of companies and administrations.

General:
13384. Apply knowledge and academic experience to the control and monitoring of the marine environment and its coastal boundary, using the state-of-the-art tools in the Marine Sciences and Technologies.
13386. Encompass and teach studies in the different research lines that converge in Marine Sciences and Technologies.
13387. Combining preservation with economic activity within the framework of current legislation promoting the development of a social and environmental awareness.
TEACHING METHODOLOGY

The course consists of 2.3 hours per week of classroom activity (large size group) and 1.2 hours weekly with half the students (medium size group).

The 2.3 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1.2 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

LEARNING OBJECTIVES OF THE SUBJECT

In this subject, the basic aspects related to the engineering of aquaculture projects will be addressed. The different types of aquaculture facilities, their characteristics, limitations and main applications (offshore/onshore installations) will be reviewed and analyzed. Emphasis will be placed on the design and implementation aspects of onshore aquaculture infrastructures in open and closed (RAS) circuits. Flow and load capacity calculations will be carried out for open circuits. The facilities for collection, conduction, pumping and water control will be analyzed, as well as water treatments (decanting, filtration, sterilization and disinfection, heating and cooling, aeration and oxygen injection), with particular emphasis on recirculation.

1. Define the parameters of vertebrate nutrition and feeding for a sustainable production.
2. Identify reproductive strategies in vertebrates as well as the management of reproduction in aquaculture.
3. Know and know how to apply the bases of sustainable management in a vertebrate production facility.

This subject is oriented to the application of technologies of observation, remote perception and automatic exploration of the marine environment, which is essential for the motorization of the coastal water bodies and the obtaining of the necessary data for the control of practically all the activities human resources in the marine environment related to the exploitation of natural and aquacultural resources of the marine and coastal environment.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
CONTENTS

Introduction to aquaculture project engineering

Description:
Objectives of the course
Aquaculture engineering

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m

Facilities

Description:
Types of aquaculture facilities
Offshore facilities (platforms, cages, long lines, other facilities)
Land-based facilities (flow-through systems, recirculation systems (RAS))
Extensive, semi-intensive and intensive systems
Species-specific engineering
Work: Aquaculture Facilities

Full-or-part-time: 16h 48m
Theory classes: 5h
Practical classes: 2h
Self study : 9h 48m

Species selection

Description:
Biological characteristics
Life cycle, reproduction and growth
Food. Disease control and general care
Work on the choice of cultivation species
Laboratory: Cultivable species

Full-or-part-time: 24h
Theory classes: 3h
Practical classes: 4h
Laboratory classes: 3h
Self study : 14h

Selection of the area

Description:
Geographic Location. Topography and soil characteristics
Water fountains. Quantity and quality of water
Water quality laboraty

Full-or-part-time: 14h 23m
Theory classes: 3h
Laboratory classes: 3h
Self study : 8h 23m
Exam 1

Full-or-part-time: 4h 48m
Laboratory classes: 2h
Self study: 2h 48m

Fluid transport

Description:
Hydraulic installations
Bernoulli equation and its applications
Exercises: Bernoulli's equation
Water flows. Pumps. Types of pumps and power. Calculation of flow rates
Dissolution of gases. Solubility equations. Gas transfer
Exercises: Pump power and flow calculation. Solubility and gas transfer.
Laboratory: Hydraulics

Full-or-part-time: 36h
Theory classes: 8h
Practical classes: 4h
Laboratory classes: 3h
Self study: 21h

Water treatment

Description:
Solids separation and biological filtration
Ventilation and oxygenation. Disinfection
Visit to water treatment plant

Full-or-part-time: 14h 23m
Theory classes: 2h
Practical classes: 4h
Self study: 8h 23m

Electrical installations

Description:
Consumption. Distribution. Lighting
Energy sources

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study: 2h 48m
Design and construction

Description:
General considerations. Design. Materials
Open-air installations
Indoor installations

Full-or-part-time: 12h
Theory classes: 5h
Self study : 7h

Cages and tanks

Description:
General considerations. Types of cages (location, dimensions, buoyancy, anchoring and maintenance)
Types of tanks (location, dimensions and maintenance)

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m

Exam 2

Full-or-part-time: 7h 11m
Laboratory classes: 3h
Self study : 4h 11m

GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

BIBLIOGRAPHY

Basic:

Complementary:
- Joan Oca Baradad e Ingrid Masaló Llorà. DISEÑO DE TANQUES EN ACUICULTURA INTENSIVA. Universitat Politècnica de Catalunya, 2011.