

Graduate courses taught at HUC

Development of Aquaculture 12 ECTS

Course Description:

The course is designed for fellows of the United Nations Fisheries Training Programme (UMFTP) as well as master's students in aquaculture. The main objective of the course is to provide professionals in aquaculture with information and training with emphasis on planning, operation and development of aquaculture. The course will be based on principles rather than being species specific. Sustainability and environmental issues will be integrated into all topics. The participants will gain sound knowledge on how to evaluate and identify the appropriate aquaculture operations for any particular environment, both in terms of suitable species, site selection and infrastructure. Participants will gain insight into the operational management of farms, both financially and technically. The participants will receive supervision in handling various tools used in management of fish farms and methods for research and development in aquaculture. An important part of the course will be visits to fish farms as well as monitoring and support structures for the aquaculture industry. The course consists of the following modules that are taught in sequence: 1. Biology and physiology of aquaculture organisms 2. The environment of the aquaculture organisms 3. Production methods and operational environment for aquaculture 4. Farm design 5. Farm operation and production planning 6. Environmental impact of aquaculture production 7. Legal framework and monitoring of aquaculture operations 8. Developing aquaculture for the future

Learning Outcomes:

♣ Participants are familiar with the main production methods used in aquaculture and the necessary operational environment of aquaculture. ♣ Participants are familiar with the basic principles of fish farm design ♣ Participants can identify suitable locations and species for aquaculture ♣ Participants can determine the feasibility of new aquaculture operations. ♣ Participants know the critical steps in developing methods for a new species in aquaculture ♣ Participants are familiar with production planning and best management practices for developing viable aquaculture operations. ♣ Participants are aware of the main environmental impacts of aquaculture and considerations for future sustainable development of the industry ♣ Participants are aware of the necessary legal framework and support structures for the aquaculture industry in each country

Evolutionary Ecology – 6 ECTS

Course Description:

The objective of the course is to introduce Evolutionary Ecology to the student. After the course the student should have a good knowledge of the relationship between ecology and evolution for diversity of fishes and speciation. We will go over the main concept of evolutionary biology and then specifically discuss; the connection between nature and diversity, the evolutionary importance of diversity, natural selection, adaptations and parallel evolution. We will as well discuss the importance of phenotypic plasticity, evolution of life history, the evolution of age at maturity and the number and size of offsprings. Furthermore factors like diversification, speciation, ecological adaptation and speciation will be discussed. In the course we will have a special focus on Icelandic freshwater systems.

Learning Outcomes:

The student should have a good oversight over the main concepts of evolutionary biology. The student should know the connection between ecology and diversity in the phenotype of organisms. The student should know and be able to explain natural selection and its importance for adaptation. The student should know ways for reproductive isolation. The student should know and be able to explain different ways for speciation. That the student understands the importance of process oriented thinking for the protection and maintenance of biodiversity

Behavioural Ecology – 6ECTS

Course Description:

Topics include: Environmentology, environmental philosophy and the pressure man puts on the world's ecological systems. Major environmental problems threatening the earth's biosphere, paying particular attention to issues concerning the utilisation of aquatic resources (freshwater and oceanic) and aquaculture, domestically as well as on an international basis. Those include water pollution, destruction of habitats, overexploitation of stocks and migration of species. An overview of international agreements and regulations concerning environmental effects. D

Learning Outcomes:

The student will possess a good basic knowledge of the major environmental problems threatening the resources of freshwater and oceans, domestically and internationally, such as - water pollution - destruction of habitats - overexploitation of stocks - migration of species - climate changes

Developmental Biology of fishes and larviculture 10 ECTS

Course Description:

The objective of the course is to introduce students to development, sex determination and maturation of animals with a special emphasis on fishes. Concurrently, the students should gain a better understanding on the topic of aquaculture of larval and juvenile fish. The course will first discuss the basic principles of vertebrate development and then move on to specific topics in fish development. The following topics will be covered: Sex determination in fishes, structure and formation of gametes, egg quality, fertilization and activation of ova, the initial stages of larval development in fishes, gastrulation and neurulation, derivatives of embryonic layers and organogenesis, direct and indirect development, comparison of development of different species, interaction of egg size and development, interaction of egg size and reproductive strategies, development of behaviour. The final part of the course will be an introduction to larviculture and methods used in that field.

Learning Outcomes:

- Students have good overview of vertebrate development.
- Students recognize the differences between fish development and the development of other vertebrates.
- Students are familiar with the genetic control of development.
- Students know the basic principles of larviculture.
- Students can start-feed fish larvae.
- Students can perform simple experiments with fish larvae.
- Students can search the scientific literature to answer scientific questions and present the results both orally and in written form.

Methods of Scientific Research 10 ECTS

Course Description:

The course covers the philosophical and ethical foundations of scientific work, and the basics of conducting scientific research, from writing a research proposal, designing research projects, to the collection, interpretation and oral and written presentation of scientific data. Lectures will deal with the philosophy and ethics of science, the scientific method and experimental design, including the difference between experiments and other research methods, hypothesis formation, pilot studies, replication, pseudoreplication, randomization, accuracy, and precision. Experimental design will also be related to common statistical methods. Emphasis is mainly on research in aquatic biology and aquaculture, but will reflect the research interests of students enrolled each time. The students read, present and criticize papers from the published scientific literature. The students will also conduct assignments related to (i) the philosophy and/or ethics of science, (ii) experimental design and procedures and (iii) statistical methods. The students will also hand in written exercises related to research proposal and/or a scientific paper, aimed at improving their scientific writing skills.

Learning Outcomes:

- To know the philosophical foundation of scientific work

- To know the basic ethical issues relating to scientific work
- To know the basics of experimental design
- To be able to design scientific studies, both observational and experimental
- To be able to interpret and scrutinize scientific results and research papers
- To know the basics of writing research proposals and grant applications
- To know how to present scientific results, both orally and in writing
- To be prepared for independent research work in the field of aquatic biology

Topics in Aquatic Biology 10 ECTS

Course Description:

The subject of the course will be a new and relevant topic within the field of Aquatic biology, selected by a teacher in the department. The teacher selects a specific detailed topic within his/her field of study. The topic will be discussed in depth and placed in the wider context of different fields within Aquatic Biology. Fields of study depend on the expertise of the supervising teacher and may e.g. include behaviour, ecology, evolution, limnology, fish physiology and aquaculture.

Learning Outcomes:

The student will be able to critically evaluate, discuss, understand and employ novel ideas in aquatic biology.

Research in Aquatic Biology 10 ECTS

Course Description:

The student selects a specific research topic in collaboration with a supervisor. The student designs and conducts a research project. The student analyses the data and reports his/her findings both in written and oral form.

Learning Outcomes:

The student can design a research project. The student can gather and analyse data from a research project. The student can keep a detailed research diary. The student can report the results of a research project as a short manuscript for publication in peer-reviewed literature. The student can report the results of a research project in a short lecture.

Literature study in Aquatic Biology

Course Description:

The student selects a specific topic in collaboration with a supervisor. They discuss scientific papers/book chapters on the topic. The course ends with the student writing an essay and gives a lecture on the topic.

Learning Outcomes:

The student will be fully able to search for and obtain references. The student will be able to critically select relevant information and combine them in a new thesis of a specific topic. The student will be able to prepare a manuscript for a publication in a peer-reviewed journal. The student is able to critically discuss and evaluate a selected topic.

Fish Physiology

Course Description:

The course allows students to acquire an understanding of fish physiology, especially issues linked to aquaculture. It covers diverse issues of fish physiology related to fish farming, such as growth, metabolism, sexual maturation, perception, food uptake and digestion. It discusses functions of various organ systems, hormonal systems, sea-water tolerance and aquatic farming. A special emphasis is placed on effect of various aquaculture environments on fish.

Learning Outcomes:

The student understands and can explain the principal functions of most organ systems and physiological processes in fish including: • Heart and blood circulation system. • Respiratory system – uptake and removal of gases. • Digestion and absorption. • Growth. • Water environment and osmoregulation. • Hormone system. • Maturation. • Perception. • Stress

Introduction to statistics with R