UNIVERSITY OF GOTHENBURG

DEPARTMENT OF BIOLOGICAL AND ENVIRONMENTAL SCIENCES

BIO560 Animal ecophysiology from a climate perspective, 15 credits

Zoologisk ekofysiologi ur ett klimatperspektiv, 15 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Faculty of Science on 2010-10-14 and was last revised on 2024-03-15 by Department of Biological and Environmental Sciences to be valid from 2024-03-15, spring semester of 2024.

Field of education: Science 100%
Department: Department of Biological and Environmental Sciences

Position in the educational system

The course is an advanced course in biology at second cycle level and is included in the *Ecophysiology* profile in the Master's (120 credits) programme in biology as well as in the elective range for the other profiles in the Master's programme in biology.

The course can also be included in the Master's (120 credits) programmes for *Marine sciences* and *Ecotoxicology* as well as be taken as a freestanding course.

The course can be part of the following programme: 1) Biology, Master's Programme (N2BIO)

Main field of studies	*Specialization*
Molecular Biology	A1N, Second cycle, has only first-cycle course/s as entry requirements
Environmental Science	A1N, Second cycle, has only first-cycle course/s as entry requirements
Biology	A1N, Second cycle, has only first-cycle course/s as entry requirements
Marine Sciences	A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

For admission to the course, knowledge are required equivalent to:

Alternative 1: Approved basic courses in biology comprising 60 credits in the subject areas of cell biology, molecular genetics, evolution, botanical and zoological physiology, ecology and biodiversity and systematics, or equivalent.

Alternative 2: The following courses must be approved: ES1201, Environmental Sciences: Natural Science, 15 credits, ES1300, Natural Resource Management, 15 credits, ES1305, Pollutants effects and dispersal on Biological Systems, 15 credits, ES1220 Ecology and evolution for environmental scientists, 15 credits and one of the following three courses: BIO900, Cell Biology, 15 credits, BIO906, Molecular Genetics and Evolution, 15 credits, BIO283, Conservation Ecology in Water Environments, 15 credits, or an equivalent basic course in environmental science with a scientific focus.

Alternative 3: Passed courses of at least 90 credits in the two first years of the Marine science, Bachelor's programme, University of Gothenburg

For all alternatives, at least one relevant advanced course (at least 15 credits) in biology needs to be passed. To provide the requirement in English by an internationally recognized test, for example TOEFL, IELTS, the English proficiency should be equivalent to the level of English 6/English Course B from Swedish Upper Secondary School.

Recommended advanced courses are BIO232 Human Physiology (15 credits, first cycle) or BIO484 Comparative Physiology of Marine Animals including Applications for Aquaculture (15 credits, second cycle).

Learning outcomes

On successful completion of the course the student will be able to:

- in detail describe the relationships between different physiological mechanisms on the basis of a whole animal perspective, as well as how these mechanisms have adapted to different external living conditions
- independently identify possible physiological effects on different animal groups as a consequence of changes in the surrounding environment
- from a scientific basis, analyse and review studies within the subject
- from given guidelines, plan and carry out a shorter experimental study
- summarise and present current relevant research, in a way suited to the expected audience
- from a scientific perspective, discuss and describe current climate-related questions

Course content

The course aims to supplement and deepen the knowledge in zoophysiology with focus on ecophysiology, that is how physiological processes of animals are influenced by the

external environment.

The intention of the course is also to give advanced knowledge in *integrative physiology*, giving an overall picture of what happens in the organism at different situations, not only what happens in a certain organ system. The course prepares for continued laboratory studies in zoophysiology and related fields.

Focus on the course lies on physiological effects of climate related factors and includes effects at the cellular level, via organs and individuals up to populations and ecosystems. The content will be adapted to current relevant issues and research, with global temperature changes and ocean acidification playing important roles.

Sub-courses

1. **Ecophysiological theory** *(Ekofysiologisk teori),* 10.5 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
   Studies on how different animals handle and manage normal variations in the environment (over days, seasons etc) will give tools to be able to predict the effects of more far-reaching environmental changes, e.g. as a consequence of global climate changes. To clarify mechanisms, comparisons are made between different species/animal groups based on natural differences between different environments, with examples from marine, limnic and terrestrial habitats. Strong emphasis is placed on animals adapted to more or less extreme environments, for example polar and tropical regions.

2. **Practical project** *(Praktiskt projektarbete),* 4.5 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
   Approximately a third of the course consists of an advanced laboratory assignment, performed in small groups under supervision. Most of the workload is concentrated during a couple of weeks, but certain preparation is required also before the project work starts.

Form of teaching

The module *Ecophysiological theory* consists of lectures, group discussions/seminars, laboratory sessions as well as individual presentations. Compulsory components are evident from the timetable and course PM.

The module *Practical project* consists of a longer laboratory assignment including both practical and written components. The project is carried out in groups under supervision, and the students must plan their time well to manage all parts.

The students are expected to be active during the entire course and come well prepared to seminars and group discussions to benefit from the teaching. Time allocated for preparations but also not non-scheduled time should be utilised. In addition to the recommended text book, hand-outs etc with relevant information for the respective

assignments will be available at GUL.

Language of instruction: English

Assessment

Continuous examination in the form of written and oral presentations is applied on the course, with both individual and group assignments. Each assignment is assessed individually, using a graded scale, and the results are combined to give the final grade on each module. Detailed instructions and assessment criteria are available for the students from the start of the course. Deadlines for submission or presentation of all assignments are evident from the schedule.

Students who does not pass the written assignments at first submission are given one (1) possibility to revise to achieve the grade Pass (only) in connection with the course. Re-exam will be in the form of an "ordinary" written exam, comprising the all course material at the same time. Supplementary qualification of laboratory components may normally not be done until next time the course is given.

If a student, who has failed the same exam twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance). In case a course has been discontinued or undergone major changes, should the student be guaranteed access to at least three examination sessions (including regular examination session) during a period of at least one year, based on the earlier set-up of the course.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).
To achieve the grade *Pass* in the course as a whole, at least *Pass* is required on both the modules. Furthermore, to achieve the grade *Pass with distinction*, *Pass with distinction* is required on at least one of the modules and on at least 85% of the individual examination assignments, as well as active participation in group discussions and seminars.

For both the modules, it is required to pass all included examination assignments. For the grade *Pass with distinction* on each module, the result on all the assignments for that module are weighed together; assessment equivalent to "*Pass with distinction*" is required on on the majority of these and *Pass* on the rest. Furthermore, for *Pass with distinction* on the module *Ecophysiological theory*, active participation in the majority (more than 75%) of the group discussions and seminars is required. For the module *Practical project* , active participation in the laboratory parts of the project is required in addition to pass on the written and oral presentations.

Course evaluation

On completion of the course, a written and/or oral course evaluation is carried out. A compilation of the course evaluation is sent to the "Biology student office" where it is available as a public document. The course evaluation is also distributed to all teachers that have participated in the course and should be taken into consideration when planning the next course. A summary of the course evaluation as well as highlighting of potential changes that have been done should be presented at the introduction next time the course is given.

Additional information

The course contains compulsory laboratory work that include animals.

The teaching is mainly conducted on "Natrium" (the Department of Biological & Environmental sciences). Extra cost for travels may occur in connection with external lectures.

Students are recommended to repeat fundamental physiological mechanisms before start of the course.

At examination, identity should be able to be confirmed.