Summer Semester Courses 2010

Summer Semester Dates 2010:

Official dates of instruction: April 19 – July 23, 2010

Fall within the regular semester dates:
Block I: April 19 – May 15
Block II: May 17 – June 11
Block III: June 14 – July 2
Block IV: July 5 – July 23

Fall outside of the regular semester dates:
Block V (summer break): August 8 – August 27
Block VI: August 30 – September 17
Block VII: September 20 – October 8

Required Courses for Second Semester Students:

• Individual Research Training 2 (IRT2)

Schedule: All semester
ECTS: 5
Module: P6.1

Students conduct a semester-long independent research project in a lab of their choice. The IRT2 module must be carried out in a different lab from the IRT1. Projects will usually be suggested by the lab advisor, but should be developed further by the student. Once they identify a topic, students research relevant background literature and write a research plan that they discuss with various people in the lab. They then conduct the study, write a final report in the style of a scientific manuscript (10,000 – 30,000 characters), and prepare a poster (as part of the Skills 3 course – see this entry for details).

• Seminar & Discussion 2: Global Change

Instructors: Wolinska, Jeschke
Times: Mondays 15:00 – 16:45
Dates: All semester (Block I – IV)
ECTS: 3
Module: P6.3

Students read and discuss scientific publications on classical themes of Evolution, Ecology, and Systematics. They prepare presentations in different formats and lead discussions on selected scientific studies, which are chosen by the instructors.

• Skills 3: Poster and Discussion

Instructors: Wolinska, Jeschke
Times: All day for two days, and then Mondays 13:30 – 15:00
Dates: Apr 15 – 16, 2010, Mondays from June 28 – July 19
ECTS: 1
Module: P6.2

Students learn how to make a poster using standard software. With the skills they learn in this seminar, they prepare a poster about their IRT2 research project, which they present at the annual EES Conference in October.

• Statistics

Instructor: Metzler
Times: Monday 13:15 – 15:00
Dates: All semester (Block I – IV)
ECTS: 3
Module: P7.3/4

This course consists of both lectures and exercises. The lectures will provide the students with an overview of the most important topics in statistics for biologists. Topics include applied statistical testing, analysis of variance, regression and likelihood methods, and analysis of variance (ANOVA). In June, students will go on a field trip (see course entitled Excursion), where they will collect and analyze field data. During the "exercises" portion of the course in July, students will spend a full week applying the knowledge they have gathered during the lectures and field trip, and becoming familiar with statistics software programs (e.g. R and SPSS).

• Excursion

Instructors: Foitzik, Laforsch, Witte, Wolinksa
Times: All day
Dates: June 7 – 13, 2010
ECTS: 3
Module: P7.1/2

This one-week interdisciplinary field trip to the Nationalparkhaus Hohe Tauern, Austria, must be taken in conjunction with the statistics course (see entry for Statistics for details). During the excursion, students will investigate an ecosystem from different angles, become familiar with different field methods, learn how to identify relevant taxa, carry out small scientific projects, and analyse their data statistically.

Block Courses for Second & Fourth Semester Students:

No Set Dates, Contact Instructor:

• Biology of the Arthropods and Molluscs

Instructor: Melzer
ECTS: 3
Module: 10.0.41/42

Before Block I:

• Evolutionary Ecology Modeling

Instructor: Gabriel
Times: 9:30 – 17:00, every day
Dates: Mar 29 – Apr 14, 2010 plus one extra block of your choice
ECTS: 6
Module: P8.0.7/8

This course, which consists of both lectures and exercises, will provide an overview of models and modeling approaches. During the lectures, students learn about various population growth models, different population interactions, simple quantitative and population genetics, and stochastic processes. The theory is applied to an example such as the evolution of pesticide resistance. Students learn methods such as time continuous models, time discrete models, individual-based models, and modeling of stochastic processes. During the exercises, students will analyze and apply different modeling approaches. They will be trained to outline, develop, and run a model using programming tools. Please note: when signing up for the course, students must select another block in which to complete their independent modeling project.

Block I:

• Basic Evolutionary Genomics

Instructor: Parsch
Times: 12:00 – 14:00
Dates: Block I
ECTS: 3
Module: P8.0.1/2

This block course will consist of lectures and exercises that provide an introduction to the field of genomics, with emphasis on methods and evolutionary applications. Topics include: genome sequencing and annotation, bacterial genomes, eukaryotic genomes,

transcriptomics, interactomics, proteomics, metabolomics.

• Principles of Behavioral Ecology (lecture and exercises)

Instructor: Foitzik, Kempenaers, Witte
Times: Variable
Dates: Block I
ECTS: 3
Module: P8.0.17/18

In this lecture- and seminar-based module we give a thorough introduction into the field of behavioral ecology. We cover the following subjects: mechanisms of behavior, communication, sexual selection, mating systems and parental care, life history, altruism and cooperation, cooperative breeding in birds and mammals, eusocial insects, habitat choice and migration and human behavioral ecology. The class is taught by behavioral ecologists working on birds and eusocial insects, so that different perspectives allow a comprehensive overview of this field.

Lectures will cover the history of behavioral ecology; mechanisms of behavior; visual, acoustic and chemical communication; mating systems; parental care; life history; cooperation; socio-biology; orientation; and human behavioral ecology.

Tutorials will include discussions of the scientific content of lectures, reading of relevant literature, working on questions, and presentations by students.

Block II:

• Multivariate Statistics in Ecology and Quantitative Genetics (lecture and exercises)

Instructors: Metzler, Hutzenthaler
Times: Variable
Dates: Block II
ECTS: 3
Module: 10.0.45/46

• Mycology: Diversity and Evolution of Fungi (lecture and practical)

Instructor: Agerer
Times: Variable
Dates: Block II
ECTS: 3
Module: P8.0.29/30

The students will learn that fungal organisms occur in different eukaryotic kingdoms and the reasons for their affiliations to these kingdoms, and will be able to distinguish between those characters useful for delimitation of relationships and those with adaptive values developed in parallel in different relationships. “Evolutionary tendencies” and

key-innovations will be discussed, and it will be highlighted that substrate specialization and co-evolution with plants promote evolution of fungi. The importance of ultrastructural, chemical, anatomical, ecological, and DNA-sequence-data for phylogenetic reconstructions will be critically discussed.

• Population Genetics I (lecture and computer exercises)

Instructors: Stephan, Hutter
Times: Variable
Dates: Blocks II & III – please note that course spans 2 blocks
ECTS: 6
Module: P8.0.5

This block course consists of both lectures and computer exercises. The lecture spans two blocks, and the computer course takes place during the last three weeks. The lecture provides insight into general principles of population genetics. Topics of discussion include forces like genetic drift, natural selection, migration and genetic mechanisms such as mutation and recombination. Specific examples will be used to show how the mechanisms affect genetic variability in plants and animals (including humans). The following topics will be covered in detail:

- Introduction (Genetic variability, Hardy-Weinberg Law, classic models of natural selection)
- Neutral theory of molecular evolution (genetic drift, mutation, recombination, effective population size, coalescent)
- Detecting natural selection (positive and negative selection, balancing selection)
- Population structure, demographic processes and systems of reproduction
- Linkage disequilibrium
- QTL analysis
- Special applications (human evolution, genome projects, uncovering disease genes using DNA polymorphism)

The aim of the computer course is to gain a better and more in-depth understanding of the topics introduced in the lecture. Modeling and analysis software will be used to visualize population genetic principles and exemplify the impact of different evolutionary forces on genetic variability. The course will focus on following topics:

- DNA polymorphism
- The neutral theory
- Effective population size
- Inbreeding and structured populations
- Genealogies and demographic models
- Recombination and linkage disequilibrium
- Various forms of selection
- Selection and polymorphism
- Neutrality tests

Block III:

• Population Genetics I

See Block II for description

• Plant Ecophysiology: Research at the Plant-Environment Interface

Instructor: Matyssek, Fleischmann, Grams, Häberle
Times: contact instructor
Dates: Block IV
ECTS: 5
Module: P8.0.13/14

Plant ecophysiology deals with the interaction of plants with their abiotic and biotic environment (e.g. drought, global change, plant-plant competition). This course gives an introduction to actual research questions and hot topics in this ecological discipline. Students will be introduced to key methods and actual research projects of the lab at various field sites. Central part of this course is developing and perusing own research ideas by the participants and implementing them within the framework of the research done in the lab. Practical field work is typically performed at one of the field stations nearby the university campus in Freising-Weihenstephan. Most teachers are researchers of the various lab projects (i.e. PhD students, Post docs, research associates).

First Week: Research topics in plant ecophysiology
Theoretical and practical introduction to various research projects of the lab. Each day is dedicated to a specific research project.
Morning sessions: Lectures on methods and research projects, literature discussions
Afternoon sessions: Visiting of research projects in the field

Second Week: Student's research questions
Setting students' research questions into action in the framework of a research project of the lab (as introduced during the first week). Groups of 2-3 students per research project.
Develop research hypothesis, establish and use of various methods, taking samples, making measurements,...

Third Week: Data evaluation and project presentations
Evaluation of data, writing paper on student's research in projects and final presentation of research done.

Block IV:

• Advanced Evolutionary Genomics

Instructor: Parsch
Times: 12:00 – 14:00
Dates: Block IV
ECTS: 3
Module: P8.0.3/4

This block course will consist of lectures and exercises that cover advanced topics in evolutionary genomics, including: comparative genomics, evolution of genome size, gene and genome duplication, origin of new genes, isochores and GC content, codon bias, evolution of sex-biased genes, evolutionary functional genomics.

• Experimental Behavioral Ecology (lecture and practical)

Instructor: Foitzik, Witte, Forstmeier
Times: Variable
Dates: Block IV
ECTS: 3
Module: P8.0.19/20

Experimental research with animals (birds, humans, fish, insects) to address questions about sexual selection, communication, orientation, and sociobiology. This lab course gives hands-on experience in diverse experiments in behavioral ecology. Short lectures introduce the scientific background to the experiments. Experiments cover a wide range of subjects and study organisms: Sexual selection in guppies (fish), nestmate recognition,division of labour and communication in ants, mate choice in humans and birds. Students are guided to develop their own experiments from the experimental design to the statistical analysis.

• Soil Mycomicrobiology (lecture and practical)

Instructor: Agerer
Times: Variable
Dates: Block IV
ECTS: 3
Module: P8.0.21/22

This course consists of both lectures and a practical. Lectures will cover different topics in soil mycomicrobiology, including fine root systems, determination of microbial biomass, physiological activity (enzyme tests of soil), patterns of substrate utilization, soil fungi, hyphal amounts in root horizons, ecological characterization of ectomycorrhizae, interactions between Nematodes and fungi, litter decomposition in the soil, and bacterial populations in the soil. Students will learn about the complexity of agriculturally- and silviculturally-used soils and of their microflora.

During the practical, students will learn about and apply important methods in soil mycomicrobiology that are discussed in the lecture. Students will be able to measure diversity and biomass of bacteria and fungi, and will learn about the significance of turnover of organic material for symbiotic or pathogenic interactions with higher organisms. In addition, students will learn to characterize the interaction with the abiotic environment, recognize soil types, discern soil characteristics, and apply important methods.

Block V:

• Microarray Analysis in Evolution

Instructor: Parsch
Times: contact instructor
Dates: Block V
ECTS: 3
Module: P10.0.17/18

This block course will mainly be held in the form of a seminar, with students presenting and discussing papers from the current literature in the field of evolutionary transcriptomics. There will also be introductory lectures by the instructor, presentations of transcriptomics-related research projects, and a practical demonstration of microarray equipment.

Block VI:

• Marine Biology Seminar and Excursion
Instructor: Haszprunar, Hess
Times: Contact instructor
Dates: Block VI or VII
ECTS: 3
Module: P8.0.43/44

This course consists of a seminar as well as a 10-day excursion to Banylus-sur-mer in the South of France. The excursion will take place sometime in September, and the seminar will take place before and after the excursion.

Block VII:

• Fungal Interactions: Mycorrhiza (lecture and practical)

Instructor: Agerer
Times: Variable
Dates: Block VII
ECTS: 3
Module: P10.0.15/16

The students will be able to assess the importance of (what is very likely to be) the oldest plant symbiosis for growth, ecology, and colonization of the land masses of the earth at the beginning of “land occupation”. They will verify the significance of the statement written in an ecological textbook “Most Higher plants do not have roots – they have mycorrhizae”. Occurrence, structure and function of the more important classes of mycorrhizae will be shown in the lecture and in the practical. Special emphasis will be placed on functional anatomics, uptake, transport and transfer of nutrients to the plants and of sugar to the fungi or – in parasitic cases – sugars from the fungi to achlorophyllous plants. Possible impacts of mycorrhizae on the evolution of land plants will be discussed, as well as negative human influences on this usually well-balanced mutualistic symbiosis.