

**Syllabus for Molecular ecology and evolution 15 ECTS credits****1. Course details**

Approved by the Education Committee of the Faculty of Science 01-03 -2007. The syllabus is valid from 01-07-2007. The course is at the Second cycle.

**2. General information**

The course is part of the of Biology program at the Faculty of Science. The course is optional in a Bachelor's or Master's degree in Science, major Biology. The course is also offered as a single subject course. The language of instruction is English if necessary.

**3. Learning outcomes**

On completion of the course, the students shall have acquired the following knowledge and understanding:

- be able to analyse the effect of genetic variation on the ecology and evolution of organisms, and perform practical methods to detect and evaluate genetic variation at different levels (allelic variation, variation within and among individuals, populations and species).
- be able to understand the ecological significance of genetic variation e.g. for speciation, adaptation to different environments, behaviours, transmission and interactions between parasite and host
- be able to understand the basics of standard methods used to detect and analyse variation at gene, genome and protein levels within and between individuals, populations and species
- be able to understand different models of evolution at the gene and protein levels
- be able to understand the content of scientific articles and reports that use molecular methods to answer questions in the context of ecology, evolutionary and conservation biology
- have received training in oral and written presentation techniques.

**4. Course content**

The course consists of two parts, 8 weeks of theory and practicals followed by 2 weeks project work in small groups.

- Collecting samples and extracts of DNA from plants, animals or microorganisms
- The basics for analysing genes and proteins in order to understand the organism's adaptations to different environments
- Learn some common methods for investigating neutral genetic variation (e.g. microsatellites, SNPs and AFLP)
- Laboratory work with PCR amplification and gene sequencing (DNA fragments)
- Exercises using the most common methods of phylogenetic analysis (tree construction) of DNA and protein sequences
- Introduction to genome-based methods for the analysis of genetic variation (genome sequencing and DNA microarrays)
- Presentation of different models of evolution at gene and protein levels and their application to the understanding of evolution at the level of species and populations
- A two-week project consisting of independent work using, in more depth, one of the methods learnt during the course.

**5. Teaching and assessment**

Teaching consists of lectures, practicals, field exercises, seminars, group exercises, project work.

Practicals, field exercises, seminars and group exercises, and the course elements associated with these are compulsory.

Examination takes the form of written tests after the first theoretical and practical moments and an oral presentation of the project at the end of the course

Students who fail the ordinary tests will have an opportunity to take another test in close proximity to the ordinary test.

## **6. Grades**

Students are awarded one of the following grades: Distinction, Pass or Fail.

To be awarded a Pass on the whole course the students shall have passed the test, have acceptable practical reports, have acceptable hand-in exercises, have acceptable project reports and to have participated in all compulsory course elements.

The final grade for the course is determined by the aggregated results of the different parts of the examination. Of a total of 50 points, 7 are allocated to practicals, 33 to the written exam and 10 to the final project

## **7. Admission requirements**

To be eligible for the course requires: General qualifications along with courses corresponding to 90 ECTS credits natural science studies including courses corresponding to MOB101 Cell Biology 10 credits and BIO006 Genetics and Microbiology 10 credits.

## **8. Literature**

According to a list determined by the department, available at least five weeks before the start of the course, see the web page for Undergraduate Studies in Biology, <http://www.lu.se/biology-education>

## **9. Further information**

The course cannot be credited as part of a degree along with BIO 648 Molecular ecology and evolution