

Molecular Ecology and Evolution (BIOR25, 15 hp) 2012

January 16- March 20

Welcome to the course in Molecular Ecology & Evolution! This course is organized by the Department of Biology, Lund University. The course is made up of two blocks. The first main block is based on lectures, laboratory and computer exercises (dry-labs). At the end of this main part (Feb 28), you will do an exam covering certain parts of the course literature (Freeland et al 2011), as well as knowledge that you have obtained during laboratory and computer exercises (that is, wet- and dry-labs). The second block during the weeks 8-10 you will carry out a project in small groups (2-4 students) which will give deeper insights into a more specialized topic in molecular ecology and/or evolution. At the end of the project period (March 20), there will be one day where you make a Power Point presentation of your own project and discuss your course-mates' projects.

Early on at the course (Tuesday, January 17), we will go on a field excursion to collect samples for further studies in the lab. We will go to Stensoffa Ecological station, close to the lake Krankesjön, ca 20 km east of Lund (bring clothes for outdoor work, boots, raingear and lunch). In the afternoon we will go back to the Ecology Building and prepare for the lab-work.

We really look forward to meet you and hope that you will enjoy the course!

Staffan Bensch & Bengt Hansson

The course will be held in English.

Introduction on Monday January 16 at 10:00 in Heden, Department of Biology, Ecology Building, Sölvegatan 37

Rooms: Most part of the course will take place in **Heden (H)**. For the laboratories we will also do some of the work in research laboratories in the Ecology Building. Your teaching assistance will instruct you about how this will be organized at the beginning of each lab.

Course literature: Molecular Ecology: Second edition. 2011.
Freeland, JR., Kirk, H., Petersen, SD. Wiley-Blackwell, ISBN 978-0-470-748233-6
Additional reading: Collection of papers & Laboratory manuals

Phone numbers: Staffan 0706-827864, Bengt 0709-916896

Compulsory subjects during the course

1. The introduction, All wet-labs, dry-labs, seminars and the excursion
2. The literature project and the final project
3. The written exam

Home page: <http://luvit.ced.lu.se/LuvitPortal/education/main.aspx?courseid=6787#>

E-mail addresses of organizers and lecturers

Main organization: Bengt Hansson & Staffan Bensch

Teachers at the course:

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WEEK 1 (Basics - PCR, sequence analyses)

16-Jan	Mon	10:00-11:15	H		Introduction and presentation	SB, BH
		11:30-12:00	H		Gather equipment and prepare for excursion	BH, MA HW, SB
		13:00-14:00	H	Lecture	DNA diagnostics and BarCoding	SB
17-Jan	Tue	08:00-15:00	Ex	Excursion	Collection of samples for DNA analysis	BH, MA HW, SB
		15:00-16:00	H	Lab	DNA extraction	JJ, MA, FS, AM
		17:00-			PIZZA	
18-Jan	Wed	8:00-12:30	H	Lab	DNA extraction continued	JJ, MA, FS, AM
		11:00	H		Photographing	
		13:30-14:30	S	Book Sem.	Chapter 1 & 2 (p.35-43)	ML [?]
		14:30-16:30	H	Lab	DNA extraction continued/set up PCR	JJ, MA FS, AM
19-Jan	Thu	09:00-09:45	H	Lecture	Basic PCR and Sequencing	BH
		10:00-13:00	H	Lab	DNA extraction continued/set up PCR	JJ, MA FS, AM
20-Jan	Fri	08:00-12:00	H	Lab	PCR products on minigels, precipitate PCR	FS, AM, (JJ)
		13:00-14:15	H	Lecture	Sequence analyses & phylogenetic trees 1	SB
		14:30-16:30	H	Lab	PCR for sequencing reaction	FS, AM, (JJ)

WEEK 2 (Basics - PCR, sequence analyses)

23-Jan	Mon	9:00-11:00	H	DryLab	Internet-based sequence analysis	SB, HW
		11:15-12:00	H	Lab	PCR continued, precipitate sequencing rxn	FS, AM, (JJ)

		13:00-16:30	H	Lab	continued, sequence rxn to ABI robot	FS, AM, (JJ)
24-Jan	Tue	09:00-10:00	H	Lecture	Using genetic data bases	DA
		10:30-12:00	H	DryLab	Alignment Exercise	SB, HW
		13:00-16:00	H	DryLab	Editing & aligning obtained DNA sequences	SB, HW
25-Jan	Wed	09:00-10:30	H	Lecture	Sequence analyses & phylogenetic trees 2	SB
		11:00-12:00	S	Book Sem.	Chapter 2 (p45-72) & 3	ML, ?
		13:00-14:30	H	Lecture	Sequence analyses & phylogenetic trees 3	SB
		15:00-16:30	H	DryLab	Make a neighbor joining tree	SB, HW
26-Jan	Thu	09:00-12:00	H	DryLab	More tree analyses of DNA sequences	SB, HW
27-Jan	Fri	09:00-10:45	H	OwnWork	Prepare for presentation	
		11:00-12:00	H	Lecture	Geneious	ML, ?
		13:00-16:00	H	Seminar	Presentation of wet and dry labs	SB, BH, et al

WEEK 3 (Populations and individuals)

30-Jan	Mon	09:00-10:00	H	Lecture	Identifying individuals and Parentage analysis	DH
		10:30-12:00	H	DryLab	Microsatellites – evaluate gels	ML, ?
		13:00-14:30	H	Lecture	Molecular methods	SB
		15:00-16:30	H	DryLab	Microsatellites – parentage analysis	ML, ?
31-Jan	Tue	09:00-10:00	H	Lecture	Microsatellites	SB
		10:30-12:00	H	DryLab	Primer design	SB
		13:00-16:30	H	DryLab	Parentage analysis with Cervus	BH, DH/ML?
1-Feb	Wed	09:00-10:00	S	Book Sem.	Chapter 4 (F-statistics and gene flow)	ML, ?
		10:30-12:00	H	DryLab	Individual identification and assignment	BH, DH/ML?
		13:00-14:00	H	Lecture	GeneMapper	BH
		14:30-16:00	H	DryLab	Conclusion & Discussion of DryLabs	BH, ?
02-Feb	Thu	09:00-10:15	H	Lecture	Genes in populations - diversity and structure	SB
		10:45-12:00	H	Lecture	Fst, Nm, Ho, He, Fis, HW, LD	BH
03-Feb	Fri	09:00-14:00	H	DryLab	Population structure – microsatellites (GENALEX)	BH, ?

WEEK 4 (Populations and individuals)

06-Feb	Mon	09:00-10:15	H	Lecture	Population structure and Phylogeography	MH
		10:45-12:00	H	DryLab	Population structure – microsatellites (GENALEX)	BH, ?
		13:00-16:00	H	DryLab	Population structure – microsatellites (STRUCTURE)	BH, ?
07-Feb	Tue	9:00-10:00	H	Lecture	Phylogeography, mini-project (introduction)	MH, BH
		10:30-12:00		Own work	Phylogeography, mini-project (select topic)	MH, BH
		13:00-16:00	H	DryLab	Population structure – mtDNA (DNASP)	BH, ?
08-Feb	Wed	09:00-10:15	H	DryLab	Population structure – mtDNA (DNASP)	BH, ?
		10:45-12:00	H	DryLab	Conclusion & Discussion of DryLabs	BH, ?

		13:00-14:00	S	Book Sem.	Chapter 6 (Phylogeography)	ML, ?
		14:00-16:00		Own work	Phylogeography, mini-project (read papers)	
09-Feb	Thu	09:00-12:00		Own work	Phylogeography, mini-project (read papers)	
10-Feb	Fri	09:00-12:00		Own work	Preparation of presentation of mini-project	
		13:00-16:00	K	Seminar	Phylogeography: presentation of mini-projects	MH, BH

WEEK 5 (Coding DNA)

13-Feb	Mon	09:00-10:00	S	Book Sem.	Chapter 8 (Studying ecologically important traits)	ML, ?
		10:30-12:00	H	Lecture	Introduction to coding DNA 1	HW
		13:00-14:00	H	Lecture	Introduction to coding DNA 2	HW
		15:00-16:00	H	Seminar	Start Literature Project	HW, LR, BH
14-Feb	Tue	09:00-12:00		Own work	Literature Project coding DNA continued	
		13:00-16:00	H	DryLab	Analyses of coding DNA 1	HW, BH
15-Feb	Wed	9:00-10:30	H	Lecture	From genomic sequences to protein function.	DA
		11:00-12:00	H	Lecture	Sequence databases. Measuring diversity	DA
		13:00-16:00	H	Own work	Literature Project coding DNA continued	
16-Feb	Thu	09:00-12:00		DryLab	Analyses of coding DNA 2	HW, LR
17-Feb	Fri	9:00-10:00	H	Lecture	Metabolic pathways	DA
		10:00-16:00		Own work	Lit project	

WEEK 6 (Coding DNA; Genomics)

20-Feb	Mon	09:00-10:00	H	DryLab	BLAST, ORF and exon prediction	TM
		10:00-16:00		Own work	Preparation Literature Projects	
		16:00			Submission Literature Project	
21-Feb	Tue	09:00-12:00		Own work	Preparation Literature Projects	
		13:00-15:00	S	Seminar	Presentation and discussion of Literature projects	HW, LR, BH
22-Feb	Wed	09:00-10:00	H	Information	Presentation of titles for own Projects	BH? et al.
		10:00-12:00	H	DryLab	Metabolic pathways	TM
		13:00-16:00	H	DryLab	A case study	TM
23-Feb	Thu	09:00-12:00	H	DryLab	A case study	TM
24-Feb	Fri	09:00-10:30	S	Book Sem.	Chapter 8, Conservation genetics	ML, ?

WEEK 7 (Exam & Projects)

27-Feb	Mon	09:00-11:00	H	Lecture	Genomes and genomics	TJ
		11:00-12:00	H	Lecture	Biological databases and bioinformatics	TJ

		13:00-15:00	H	DryLab	Biological databases and bioinformatics, continued	TJ
28-Feb	Tue	09:00-10:00	H	Lecture	Transcriptomes and functional genomics	TJ
		10:30-11:30	H	Lecture	Transcriptomes and functional genomics	TJ
		13:00-14:00	H	DryLab	Microarray data analyses	TJ
1-Mar	Wed	09:00-15:00	H	DryLab	Microarray data analyses continued	TJ
1-Mar	Thu				Prepare for exam	
2-Mar	Fri	11:00-12:00	H		Questions on the Exam	SB, BH et al.
WEEK 8 (Projects & Genomics)						
05-Mar	Mon	09:00-16:00	H	Exam	Written exam	SB, BH et al.
06-Mar	Tue				Own project	
07-Mar	Wed				Own project	
08-Mar	Thu				Own project	
09-Mar	Fri				Own project	
WEEK 9 (Own projects)						
12-Mar	Mon				Own project	
13-Mar	Tue				Own project	
14-Mar	Wed				Own project	
15-Mar	Thu				Own project	
16-Mar	Fri				Own project	
WEEK 10 (Own projects)						
19-Mar	Mon				Own projects	
20-Mar	Tue	08:30-12:30	H	Seminar	Presentation of own projects	SB, BH
		12:30	H		Complete your course evaluation	