

Biometry and bioinformatics III, spring 2014

Biometry and bioinformatics III, Autumn 2013-Spring 2014

Lecturer

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Scope, type, prerequisites and relationships to other courses

5-10 cr, intermediate / advanced studies.

The course is suitable for students having knowledge from (at least) basic courses on probability and statistical inference. [Biometry and bioinformatics I](#) and [II](#) are recommended, but not absolutely necessary.

A strong recommendation is to take this course (at least the beginner's part I, if you are not familiar with R): [Statistical software tools I-II](#) as the weeks 5-7 in [BB_III](#) program is very much based on R-software.

The first 5cr part in II-teaching period is compulsory in Bioinformatics Master's Programme studies.

Statistics students, planning orientation to specialization area [Biometry and bioinformatics](#) (or any other specialization area, for collecting optional intermediate or advanced study credits): You can take the first part (5cr, II period) in your second study year, if you have taken [Data-analyysi R-ohjelmistolla](#) during your first study year. If you plan to take also the III period part (additional 5cr), then the recommendation is that you take the [Bayes-päättely](#)-course in parallel (Note that the link goes to spring 2013 version so that you can get familiar with the existing material, see course moodle behind the link. In spring 2014 the Bayes-course course follows the same time schedule. Note also that although the Bayes-course will be lectured in Finnish, all material and exercises will be in English.)

If you are not familiar with R-software/programming, you can take this [BB_III](#) course program from the weeks 1-4 and get 3cr from the course (i.e. you skip weeks 5-7 and take an exam which is not based on those week's content). There will also be a possibility to skip weeks 5-7, but - upon negotiations - do something extra based on weeks 1-4 for extending the 3cr -> 5cr.

The general topic of this course is statistical genetics. If you have taken previously the course [57734 Statistical genetics](#), you can take 4 cr from the Autumn II period part of the course (one assignment set will be the same as in [57734](#)) and 5 cr from the Spring III period part which does not overlap with the previous Statistical genetics course.

Lectures / computer sessions

II period, 5 cr. Tuesday 14-19.30, C128 (computer class). In 26.11, 3.12, 10.12 lecture 14-16 in CK112 and 16 -> in C128.

III period, 5 cr. Tuesday 14-16 in B120 and (TBA).

Course sessions start with ~2 hour lecture/tutorial, and continue with practical working: class and lecturer's time for tutoring are available whole evening (till 19.45 when the classroom is closed), but it may not be necessary to stay in class so long.

[The session 5.11 in an exception: whole ~6 h session will be lecturing.](#)

The course consists of lectures, discussions, tutorials during computer sessions, assignments initiated during computer sessions and completed during student's own, additional, time.

The spirit of the course is learning by doing (data-analysis, exercises by pen-and-paper, simulations) and reading scientific papers, rather than listening lectures.

Course grade

Passing the course with grade 1: Assignments done and half of the maximum points from the exam (Note that half of the maximum points is the general rule for passing a course by grade 1. As about half of the course consists of working in computer class, accompanied with assignments, this course is not a standard lecture course from which assignments/exercises might give some extra bonus to a final grade => Assignments and exercises are compulsory. It is possible to perform assignments and exercises without participating the lectures/computer class sessions (note, however, that these sessions give the tutorials.)

Passing the course with grade 5: Assignments and exercises done and 5/6 of the maximum points from the exam (5/6 is the general rule for passing a course by grade 5.)

Passing the course by grades 2-4: Exam points between the above extremes.

Preliminary content scheme for the 5 cr part in II teaching period

Weeks 1-2

Genetic diversity, inheritance, pedigree and haplotype analysis, linkage disequilibrium, population genetics and genomics, in general: genetics + probability & statistics

Weeks 3-4

Statistical and computational analysis of evolutionary factors shaping genetic compositions and population structures

Weeks 5-7

Genome-wide association studies, GWAS-minicourse (in addition, exercises and assignments from weeks 1-4)

Course material, lecture slides, scientific papers, software links, assignments

Tuesday 29.10, 14.15 - , C128

Lecture:

Basic concepts, inheritance and population genetics, exercises 1.pdf
Basic pop gen simulations

Literature related to lecture:

A century of Hardy Weinberg equilibrium.pdf
LD_understanding the evolutionary past and mapping the medical future.pdf

Tuesday 5.11, 14.15 - 19.30, C128

Lecture:

Modelling mutations, selection, drift - part I, exercises 2.pdf

Literature related to lecture:

Revising human mutation rate, understanding human evolution.pdf
Human genomic disease variants, A neutral evolutionary explanation.pdf

Christian Benner: [Statistical Concepts In A Nutshell Part1.pdf](#) [Statistical Concepts In A Nutshell Part2.pdf](#)

Literature for all-round education in statistics + genetics:

A century after Fisher - time for a new paradigm in quantitative genetics.pdf
Bayesian revolution in genetics.pdf

Tuesday 12.11, 14.15 ->, C128

Lecture:

Coalescence theory and selection tests.pdf
An illustrative guest lecture on coalescence.pdf

Practicals:

Exercise set 3.pdf

Human data: [HLA_DRB1_freqtable.xlsx](#) , [HLA_DRB1_alleles.txt](#)

(Postponed to extra credit work. Bacteria data: [USA_before_vacc.txt](#) , [USA_after_vacc.txt](#) , [Skand_before_vacc.txt](#) , [Skand_after_vacc.txt](#)
Virus data: TBA)

Software (installed in C128; you can also install to your own computer):

[DnaSP 5.10.1](#) , [DnaSP Manual.pdf](#)

[Network 4.6.1.1](#) , [Network Manual.pdf](#) , [Median-joining networks.pdf](#)

Literature related to lecture and practicals:

[Genealogies, coalescent theory, polymorphism analysis.pdf](#)
[Selection and adaptation in the human genome.pdf](#)
[Kingman's Coalescence paper.pdf](#)

Tuesday 19.11, 14.15 ->, C128

Practical working with exercise set 3, see last week material which is now updated.

[Link to Tuesdays 26.11, 3.12, 10.12, GWAS-minicourse](#)

BB III - Moodle

EXAM

Exam questions will be given 12. December and answers to be returned 17. December.

If you skip the GWAS-module (=> 3 credits, with the possibility to do additional exercises later => more credits), then you don't answer to GWAS-questions.

If you take the whole course (=> 5 credits), you answer also to GWAS-questions.

See [GWAS-page](#) for information about exam content.

From the weeks 1-4 the exam is based on lecture and literature material in course page. There may also be a problem solving question (like in exercise sets 1 and 2).

The practical part of exercise 3 is NOT included in the scope of exam.

Info about the additional 5cr in Spring 2014 will appear here

During 13.1 - 17.1.14 you will receive personal response about your exam answers, grade, credits, as well information about forthcoming program.

Registration

Did you forget to register? [What to do?](#)

