name	**Sequence Analysis**
code	
coördinator	Prof. Dr J. Heringa/Dr. J. Kleinjung
lecturers	Prof. Dr J. Heringa, Dr. J. Kleinjung, and other lecturers
ECTS	6
Time period	November/December 2004
aim	A theoretical and practical bioinformatics course about biological sequence analysis. The course provides an introduction to the algorithmic and biological principles of sequence analysis, as well as practical implications. *Goals:* • At the end of the course, the student will be aware of the major issues, methodology and available algorithms in sequence analysis. • At the end of the course, the student will have hands-on experience in tackling biological problems in sequence analysis.
contents	*Theory*: • Dynamic programming, database searching, pairwise and multiple alignment, probabilistic methods, pattern matching, evolutionary models, and phylogeny. *Practical*: Assignment programming own alignment software based on dynamic programming Assignment homology searching and pattern recognition using biological and disease examples Assignment multiple alignment of biological sequences
methodology	13 Lectures (2 two-hour lectures per week) Assignment introductions Computer practicals Hands-on support
literature	E-course material: *http://ibivu.cs.vu.nl* Books: Richard Durbin, Sean R Eddy, Anders Krogh, Graeme Mitchison (1998). Biological Sequence Analysis. Cambridge University Press, 350 pp., ISBN 0521629713.
teaching	Active participation (November/December 2004).
test	Assignment results and oral or written exam (depending on number of course students)
target group	Students with Bachelor Physics, Chemistry, Mathematics, Computer Science, Biology, or Medical Natural Sciences, with a strong interest in Bioinformatics
remarks	The course is taught in English
required knowledge	Bachelor Physics, Chemistry, Mathematics, Computer Science, Biology, Medical Natural Sciences. Some experience in programming is required.

name	**DNA/Protein Structure-Function Analysis and Prediction**
code	
coördinator	Prof. Dr J. Heringa/Dr. J. Kleinjung
lecturers	Prof. Dr J. Heringa, Dr. J. Kleinjung, and other lecturers
ECTS	6
Time period	January/February 2005
aim	A theoretical and practical bioinformatics course on the analysis and prediction of structure-function relationships of DNA and protein molecules. The course provides an introduction to the molecular principles of structure and function, available bioinformatics analysis and prediction techniques, and biological databases. *Goals:* • At the end of the course, students will be aware of the major issues, methodology and . • At the end of the course, the student will have hands-on experience in molecular modeling and studying structure-function relationships.
contents	*Theory*: • Protein folding and energetics, experimental structure determination, protein fold families, protein structure databases, protein secondary structure prediction, fold prediction, molecular modeling, protein-protein interactions, DNA/RNA structure/function, DNA/RNA structure prediction *Practical*: Assignment homology modelling Assignment immunocomplex modelling
methodology	13 Lectures (2 two-hour lectures per week) Assignment introductions Computer practicals Hands-on support
literature	E-course material: http://ibivu.cs.vu.nl Books: Carl Branden & John Tooze (1998). Introduction to Protein Structure. 2nd Edition or higher. Garland Science, 410 pp., ISBN 0815323050.
teaching	Active participation (January/February 2005).
test	Assignment results and oral or written exam (depending on number of course students)
target group	Students with Bachelor Physics, Chemistry, Mathematics, Computer Science, Biology, Medical Natural Sciences or Medicine, with a strong interest and some basic knowledge in Bioinformatics
remarks	The course is taught in English.
required knowledge	Bachelor Physics, Chemistry, Mathematics, Computer Science, Biology, Medical Natural Sciences. A completed course *Sequence Analysis* is a strong advantage.

Name	**Bioinformatics data analysis and tools**
code	
coördinator	Prof. Dr J. Heringa/Dr. J. Kleinjung
lecturers	Prof. Dr J. Heringa, Dr. J. Kleinjung, Dr. D. Lukatsky (AMOLF, Amsterdam) and other lecturers
ECTS	6
Time period	May/June 2005
aim	A theoretical and practical bioinformatics course on the fundamentals of bioinformatics tools and tool creation for biological data mining. Goals: • At the end of the course, students will be aware of the issues, methodology and available bioinformatics tools for • At the end of the course, students will have hands-on experience in molecular modeling and studying structure-function relationships.
contents	Theory: • Inverse protein folding, introduction to statistical thermodynamics of soft and biological matter (5 lectures), genetic algorithm, repeat recognition tools and concepts (e.g. transitivity), molecular mechanics simulations, (hidden) Markov models, pattern recognition, machine learning techniques Practical: Assignment Statistical Thermodynamics Assignment hidden Markov modelling
methodology	13 Lectures (2 two-hour lectures per week) Assignment introductions Computer practicals Hands-on support
literature	E-course material (slides, assignment material, papers): http://ibivu.cs.vu.nl Books: Biological Physics. Energy, Information, Life. Philip Nelson. 600 pages , W H Freeman & Co., (July 2003), ISBN: 0716743728
teaching test	Active participation (April/May 2005). Assignment results and oral or written exam (depending on number of course students)
target group	Students with Bachelor degree in Physics, Chemistry, Mathematics, Computer Science, Biology, Medical Natural Sciences or Medicine, with a strong interest and some basic knowledge in Bioinformatics
remarks	The course is taught in English.
required knowledge	A completed course *Sequence Analysis* and *DNA/Protein Structure-Function Analysis and Prediction* is a strong advantage. Some experience in programming is required.

name	**Genome Analysis**
code	
coördinator	dr. R. van Spanning /prof. dr J. Heringa
lecturers	dr. D. Bald, dr. R. Govers, dr. A.S. Groffen, prof.dr. J. Heringa, dr.ir. B.W. Kooi, dr. K.W. Li, dr. J.M. Kooter, prof.dr. A.B. Smit, dr. J.L. Snoep, dr. R.J.M. van Spanning (course section leader), dr. O. Stiedl, dr. I.H.M. van Stokkum, Dr. R.F. Toonen, dr. H.S. van Walraven, prof.dr. M. Verhage (course section leader), prof.dr. H.V. Westerhoff (course section leader), dr. H. de Wit
ECTS	6
Time period	September 2004
aim	A 1-month intensive course for introduction to genomics and bioinformatics techniques used to analyse and integrate genomics data sets.
contents	*Static genome analyses:* DNA, RNA and protein primary, secondary, tertiary en quaternary structures; genome sequencing, methods and annotation; genome projects (bacteria, yeast, plant, animal, human), bioinformatics and databases; COG, EST, SNP, motifs *Dynamic genome analyses:* transcriptome (arrays en clustering, QPCR, SAGE); proteomics (mass spectrometry, arrays, 2D gel electrophoresis, homology modeling); metabolomics (methods, interpretation, databases) *Functional genetics:* knock-out, reporter genes, expression vectors, promoter-probe studies; reverse genetics, RNAi, transgenese *Integrative genome analyses:* network modelling, Metabolic Control Analysis, biochemical databases; physiomics *Application areas:* medical genomics; ecogenomics; sociogenomics; pharmacogenomics; biotechnological genomics; ethical aspects
methodology	15 short modules, each including a lecture, (computer) practical and self study Tutorials/discussions of book material, lecture notes Computer practicals Lab demonstrations: Students follow and assist an experienced postdoc/Ph D student performing a key experiment. Data evaluation and interpretation on site.
literature	Powerpoint presentations via Blackboard Book: *A primer of genome science.* Gibson G and Muse, SV, Sinauer Associates Inc Publishers, 2002, ISBN 0-87893-234-8 (pbk). E-course material: http://ibivu.cs.vu.nl
teaching	Active participation
test	Exam (50%), assignments (25%) and computer analyses (25%)
target group	Students with Bachelor Physics, Chemistry, Mathematics, Computer Science, Biology, or Medical Natural Sciences, with a strong interest in Bioinformatics
remarks	The course will be taught in Dutch; provisions can be made for English speakers.
required knowledge	Bachelor Physics, Chemistry, Mathematics, Computer Science,

Biology, Medical Natural Sciences.

name	**Integrative Bioinformatics - Intracellular networks**
code	
coördinator	Prof. dr H.V. Westerhoff/ Prof.dr. J. Heringa
lecturers	Prof. Dr H.V. Westerhoff, Dr B.M. Bakker, Prof. Dr J. L. Snoep, and guest lecturers
ECTS	5 (course) +1 (extra integrative bioinformatics assignment)
Time period	April 2005
aim	A 1-month intensive course providing an introduction to cell biological networks.
contents	*Theory*: The course gives an introduction to the behavior of intracellular networks, including metabolic pathways, signal transduction chains, gene expression pathways and their hierarchical organization. Metabolic and Hierarchical Control Analysis, Biological Non Equilibrium Thermodynamics, Genetic Network Analysis, Elementary Mode Analysis, Flux (Balance Analysis) will be explained and practiced. The levels of genomics (genome, transcriptome, proteome, metabolome and function) and their interrelationships will be clarified, both theoretically and experimentally. *Practical*: • inspection experiments performing flux and metabolite; measurements and subsequent regulation analysis; inspection experiments; designing network targeted inhibitors of parasites; flux analysis on the basis of a set of computer data; control analysis on the basis of earlier experimental results; • extra assignment integrative bioinformatics for bioinformatics master students (1 ECTS)
methodology	Lectures Tutorials/discussions of book material, lecture notes Web-courses (www.siliconcell.net) Computer practicals Lab-inspection work: Students follow and assist an experienced postdoc/Ph D student performing a key experiment. Data evaluation and interpretation on site.
literature	Reader (10 euro) E-course material: http://www.bio.vu.nl/hwconf/teaching/Mathbiochemie/; www.siliconcell.net Books: Chapters from:Understanding the Control of Metabolism (Fell, D) Portland Press; Metabolic Engineering in the Postgenomic Era (Kohlodenko & Westerhoff, Editors), Horizon Bioscience;

	Thermodynamics and Control of Biological Free-energy transduction (Westerhoff and Van Dam), Elsevier
teaching	Active participation (March/April 2005)
test	Written exam
target group	Students with Bachelor Physics, Chemistry, Mathematics, Biology, Medical Biology with a strong interest in the interface between these disciplines and bioinformatics
remarks	The course is taught in the English language and involves extensive direct contact with the professors and associate professors.
Required knowledge	Bachelor Physics, Chemistry, Mathematics, Informatics, Biology, Medical Natural Sciences, or equivalent;