Course Schedule

(ver. 210406)

5MO115 BioInformatics and Genome Analysis, 7.5hp (2021-05-03 – 2021-06-04)

Course leader: Uwe Sauer, Dept. of Chemistry, Computational Life Science Cluster, CLiC and KBC,
tel.: 090 786-5930, e-mail: uwe.sauer@umu.se

Course time: Start: 1**0:00, Monday May 3rd,** end **Friday June 4th, 2021**

Lecture locations: No physical lectures on campus. Only on-line lectures in form of Zoom meetings (See links below.)
Uwe Sauer: https://umu.zoom.us/j/9383176495
Tommy Löfstedt: https://umu.zoom.us/j/66355612935?pwd=SUtnNVc5RTBLdzV6N0pjNk4yZVpkdz09
Per Stenberg: https://umu.zoom.us/j/65482310750?pwd=QlI3UDlIUThFc0xRUFA5T08vN1ZUUT09
Nathaniel Street lecture: https://youtu.be/ApMTSJ88EU0,
questions after lecture: https://umu.zoom.us/j/61662912856?pwd=ODZMbzNyOC84ZjN3aysveWprT2U1dz09
Patrik Rydén: https://umu.zoom.us/j/66166796542

PC-Lab location: **depending on teacher, see respective Zoom links above**

Take Home Examination, THE: Date Start: **Monday, 24th of May 13:00,** End **Friday, 28th of May at 17:00 sharp!**

Written Examination, WEx: Date: **Friday, 4th June, 2021,** Time: **09:00-12:00 (Details will be announced.)**

Re-Exam (omtenta) Date: **week 34 (Mon. 23 – Fri. 27 Aug. 2021, the exact date will be announced.)**

Text book: **"Introduction to Bioinformatics 4th ed."** By Arthur M. Lesk.
Oxford University Press 2014, ISBN: 978-0-19-965156-6. (pp 371)

Additional literature: "**Trends guide to BIOINFORMATCS**", Trends Supplement 1998, Elsevier Trends Journals (available on CAMBRO).
It covers all aspects of Bioinformatics. I strongly recommend to read it from cover to cover! (only 33 pages!)

Course lecturers:

Uwe Sauer (US)	uwe.sauer@umu.se	Dept. of Chemistry & Computational Life Science Cluster, CLiC
Tommy Löfstedt	tommy.lofstedt@umu.se	Dept. of Computing Sciences
Nathaniel Street (NS)	nathaniel.street@umu.se	Dept. of Plant Physiology, Umeå Plant Science Centre, UPSC
Per Stenberg (PS)	per.stenberg@umu.se	Dept. of Ecology and Environ. Sci. & Computational Life Science Cluster, CLiC
Patrk Ryden (PR)	patrik.ryden@umu.se	Dept. of Mathematics and Mathematical Statistics

Week 18	Monday 03/05	Tuesday 04/05	Wednesday 05/05	Thursday 06/05	Friday 7/05
9:00 – 09:50					
10:00 – 10:50	Welcome to the course Information and goals **Lecture:** Background to the "Neanderthal K-Ras" Case study	**Lecture:** cont. Sequence alignment I: Pairwise Sequence alignments, PSA **Lesk3 Ch-1, 1-61**,	**Summary PC1** **Lecture:** Sequence alignment II: Substitution matrices **Lesk4 Ch-5**	**Lecture:** Sequence alignment II: Multiple sequence alignments, MSA, visualizing alignments **Lesk4 Ch-5**	**Lecture:** Pair-wise seq. ali. III: Dynamic programming (continue) **Lesk4 Ch-5** **Summary PC2**
11:05 – 12:00	**Lecture:** Introduction to Bioinformatics Serial Cloner & Sequence alignment I: Pairwise Sequence alignments, PSA **Lesk4 Ch-5**	**Lecture:** Sequence alignment I: Pair-wise seq. alignments & "Dot plots" **Lesk4 Ch-5** **Introduction PC1:** Gene finding and sequence searches	**Lecture:** Sequence alignment II: Substitution matrices, E-values and scores **Lesk4 Ch-5**	**Lecture:** Sequence alignment III: Dynamic programming **Lesk4 Ch-5** **Intro PC2:** PSA, MSA, Patterns	**Lecture:** Hidden Markov Models **Lesk4 Ch-5, 201-203** **Intro PC3** Ras structure
12:00 – 13:00	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**
13:00 – 16:00		PC1: Sequence searches, gene finding and ORFs		PC2: PSA, MSA	PC3: Ras structure
16:00 – 17:00 unsupervised		PC1: Sequence searches, gene finding and ORFs		PC2: PSA, MSA	PC3: Ras structure

Week 19	Monday 10/05	Tuesday 11/05	Wednesday 12/05	Thursday 13/05 Swedish Holiday	Friday 14/05
9:00 – 09:50					
10:00 – 10:50	**Summary PC3** **Lecture:** Domains in proteins **Lesk4 Ch-2, 101-102, Ch-8, 310-312**	**Summary PC4:** Domains **Lecture:** Introduction to Comparative modelling **Lesk4 Ch-6, 238-250**	**Lecture:** Fold recognition & Threading **Lesk4 Ch-6, 250-255**		
11:05 – 12:00	**Lecture:** Structure superimposition **Lesk4 Ch-6, 235-241** **Intro PC4:** Domains	**Lecture:** Protein folding and stability: Levinthal & Anfinson **Lesk4, Ch-6, 223-230, 246-** **Intro PC5:** Comparative Modeling	**Lecture:** Python Reviewed **Summary PC5 and Tutorial:** Concluding the "Neanderthal KRas " Case study		
12:00 – 13:00	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**
13:00 – 16:00	PC4: Protein domains	PC5: Comparative Modeling	PC6-Python-1		
16:00 – 17:00 unsupervised	PC4	PC5	PC6- Python -1		

Week 20	Monday 17/05	Tuesday 18/05	Wednesday 19/05	Thursday 20/05	Friday 21/05
9:00 – 09:50		**Lecture:** Protein design; Paracelsus challenge. **Lesk4 Ch-6, 243-245**	**Lecture:** Next Generation Sequencing (NGS) and sequence analysis Per Stenberg, PS	**Lecture:** Artificial Intelligence (AI) – Deep Learning. Tommy Löfstedt	**Lecture:** "Introduction to statistics" Patrik Ryden, PR
10:00 – 10:50	**Lecture:** Python Reviewed	**Lecture:** Disordered Proteins **Short Quiz (Kahoot)**	**Lecture:** continue NGS PS	**Lecture:** "Omics data analysis and systems biology" Nathaniel Street **Lesk4, Ch-7, 282-293** Watch lecture on YouTube: https://youtu.be/ApMTSJ88EU0	**Lecture:** "Introduction to statistics" PR
11:05 – 12:00	**Lecture:** Phylogenetic analysis **Lesk4, Ch-5, 203-215**	**Lecture:** Introduction to Linux	**Lecture:** continue NGS PS	**11:30-12:00:** Nathaniel Street will answer questions to his lecture on zoom **	**Lecture:** "Introduction to statistics" PR
12:00 – 13:00	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**
13:00 – 16:00 unsupervised	PC7- Python -2	PC8 Linux practical (you will need VPN to UmU and to install "PuTTy")	PC-lab: NGS fragment assembly and analysis PS	**Short lecture on Ethics** and Bioinformatics **Film: GATTACA** or "Bioinformatics in the not so far future?"	Time to finish the Python labs
16:00 – 17:00 unsupervised	PC7- Python -2	PC8 Linux practical	PC-lab: NGS fragment assembly and analysis PS	**Film: GATTACA**	Time to finish the Python labs

****Thursday 20/5 at 11:30 – 12:00:** zoom link for Nathaniel Street question session: https://umu.zoom.us/j/61662912856?pwd=ODZMbzNyOC84ZjN3aysveWprT2U1dz09

Week 21	Monday 24/05	Tuesday 25/05	Wednesday 26/05	Thursday 27/05	Friday 28/05
9:00 – 09:50					
10:00 – 10:50		Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)
11:05 – 12:00		Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)
12:00 – 13:00	Lunch	Lunch	Lunch	Lunch	Lunch
13:00 – 13:50	13.00 start Take Home Exam, THE, is on-line	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)
14:00 – 14:50	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)
15:00 – 15:50	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)	Take Home Exam (THE)
16:00 – 17:00					17.00 sharp DEADLINE for returning the THE!!

Week 22	Monday 31/05	Tuesday 01/06	Wednesday 02/06	Thursday 03/06	Friday 04/06
9:00 – 09:50					**Written Exam (WEx) via zoom (similar to structural biology exam)**
10:00 – 10:50	Prepare for WEx	**Question session**: Last chance to ask questions before the written Exam (WEx)	Prepare for WEx	Prepare for WEx	**Written Exam (WEx)**
11:05 – 12:00	Prepare for WEx	**Question session**: Last chance to ask questions before the WEx	Prepare for WEx	Prepare for WEx	**Written Exam (WEx) End 12.00**
12:00 – 13:00	**Lunch**	**Lunch**	**Lunch**	**Lunch**	
13:00 – 13:50	Prepare for WEx	Prepare for WEx	Prepare for WEx	Prepare for WEx	
14:00 – 14:50	Prepare for WEx	Prepare for WEx	Prepare for WEx	Prepare for WEx	**END of the 5MO115 Course**
15:00 – 15:50	Prepare for WEx	Prepare for WEx	Prepare for WEx	Prepare for WEx	
16:00 – 17:00					