

## Course Schedule

### **5MO114**

### **Structural Biology, 7.5hp**

**Course time:**

Wednesday 24 March to Friday 30 April, 2021

**Course location:**

Zoom meeting code Liz: ID= 523-563-333

Zoom meeting code Uwe: ID=907-410-358

**Examination:**

Friday 30 April, 9:00-13:00 in room ?

Most likely exam on-site

**Text book:**

We will use the newly released **second edition** of the book:  
“Textbook of Structural Biology”

Second edition: Release date 2016-10-01

Anders Liljas et al. World Scientific Publishing, Singapore, 2016  
ISBN: 9789813142473

If you have a copy of the first edition it will also work.

**Hand outs:**

All lectures will be available at Cambro.

**Course leaders:**

Elisabeth Sauer-Eriksson, Chemistry, tel: 786-5923

e-mail: [elisabeth.sauer-eriksson@umu.se](mailto:elisabeth.sauer-eriksson@umu.se),

Uwe Sauer, Chemistry, tel: 786-5930

e-mail: [uwe.sauer@umu.se](mailto:uwe.sauer@umu.se)

**Course lecturers:**

Elisabeth Sauer-Eriksson (ESE)

Uwe Sauer (US)

**Invited lecturers:**

Terese Bergfors, (TB) Dept. of Molecular Biology, Uppsala University

Ronnie Berntsson (RB) Dept. of Medical Chemistry

Anders Olofsson (AO) Dept. of Medical Chemistry

Anders Öhman (AÖ) Dept. of Pharmacology and Clinical Neuroscience

Linda Sandblad (LS) Dept. Chemistry and Umeå Center for Electron Microscopy (UCEM)

Michael Hall (MH) Umeå Center for Electron Microscopy (UCEM)

Irina Iakovleva (Irl) Dept. Chemistry

## Week 1 (vecka 12)

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### Wednesday 24 March

9:00-9:45	Introduction to the course. Presentation of seminar and proposal topics (ESE).
10:00-12:00	Basics of protein structure (ESE)

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### Thursday 25 March

9:00-9:45	Chapter 2, 3, 12 Protein folds (ESE)
10:00-12:00	Introduction to 3D protein structure determination by X-ray diffraction (XRD) methods (US)
12:00-13:00	Lunch
13:00-16:00	PC-lab-1 (ESE) "Introduction to ICM-Browser and RCSB – getting familiar with protein structures"

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### Friday 26 March

9:00-9:45	Chapter 2, 3, 12 Protein folds (ESE)
10:00-12:00	Introduction to 3D protein structure determination by X-ray diffraction (XRD) methods (US)

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## Week 2 (vecka 13)

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### Monday 29 March

9:00-12:00		Crystallization of macromolecules, Robotics, DLS, (TB) "The art of making a good seminar presentation" (TB)
13:00-17:00	KB-F4_06 KB-F4_08	<i>Tutorial (not obligatory practical) Day 1:</i> 16 students/group (13-15, and 15-17, 8 students /lab) Setting up crystallization trials (IrI)

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### Tuesday 30 March

9:00-10:30		Metals and cofactors in proteins (ESE)
11:00-12:00		3D structure determination by X-ray diffraction (US)
12:00-13:00		Lunch
13:00-16:00		PC-lab 2 (ESE) "Cofactors and metals"

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### Wednesday 31 March

9:00-12:00		Chapter 5 DNA and RNA structures (ESE) Chapter 10 Transcription and gene control (ESE)
12:00-13:00		Lunch
13:00-16:00		PC-lab 3 (ESE) – "Identification of protein folds"

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### Thursday 1 April

9:00-12:00		3D structure determination by X-ray diffraction (US)
12:00-13:00		Lunch
13:00-16:00		<i>Tutorial Day 2:</i> Inspection of crystallization trials (IrI) (20 minutes per group, 3 microscopes → 9 groups/hour)

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### Friday 2 April

**Long Friday**

## Week 3 (vecka 15)

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### **Monday 12 April** *Deadline for proposals at the latest 6:00 pm*

9:00-10:00 Protein Engineering (ESE)  
10:30-12:00 3D structure determination by X-ray diffraction (US)

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### **Tuesday 13 April**

#### *Proposal presentation day 1*

9:00-10:00 3D structure determination by X-ray diffraction (US)  
10:30-12:00 Single molecules and Scanning Probe Microscope (AO)

12:00-13:00 Lunch

13:00-16:00 Student proposal presentations, Groups 1-8 only  
(ESE, US – go into Zoom ID = ESE)

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### **Wednesday 14 April**

#### *Proposal presentation day 2*

9:00-12:00 3D structure determination by X-ray diffraction (US)

12:00-13:00 Lunch

13:00-16:00 Student proposal presentations, Groups 9-17 only  
(ESE, US – go into Zoom ID = ESE)

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### **Thursday 15 April**

9:00-10:00 3D structure determination by X-ray diffraction (US)  
10:30-12:00 Chapter 15 Fibrous proteins (ESE)

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### **Friday 16 April**

8:30-10:00 Chapter 4,13 Membrane proteins (RB)  
10:15-12:00 Electron microscopy in Structural Studies (MH, LS)

12:00-13:00 Lunch

13:00-15:00 Electron microscopy in Structural Studies (MH, LS)

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## Week 4 (vecka 16)

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### Monday 19 April

9:00-10:30

Chapter 14 Signal transduction (ESE)

11:00-12:00

3D structure determination by X-ray diffraction (US)

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### Tuesday 20 April

9:00-10:00

CRISPR/Cas from a structural perspective (ESE)

10:30-12:00

3D structure determination by X-ray diffraction (US)

12:00-13:00

Lunch

13:00-16:00

PC-lab-4 “Protein design – Case study” (ESE)

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### Wednesday 21 April

9:00-12:00

3D structure determination and “räknestuga” (US)

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### Thursday 22 April

9:00-12:00

NMR background theory (AÖ)

12:00-13:00

Lunch

13:00-15:00

NMR practicals (AÖ)

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### Friday 23 April

9:00-10:00

NMR in drug discovery (AÖ)

10:30-12:00

3D structure determination by X-ray diffraction (US)

12:00-13:00

Lunch

13:00-15:00

PC-lab-5 “Interpretation of electron density maps” (ESE)

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## Week 5 (vecka 17)

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### Monday 26 April

9:00-12:00	3D structure determination by X-ray diffraction. Summary (US)
12:00-13:00	Lunch
13:00-14:00	PC-labs “Problems” (ESE)

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### Tuesday 27 April

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### Wednesday 28 Apr

10:00-12:00	Time for questions (ESE & US) (Start with ESE Zoom ID= 523-563-333)
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### Thursday 29 April

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### Friday 30 April

9:00-13:00	see page 1	<b>Exam</b>	Questions will be written in English but can be answered in English or Swedish
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### Reading in Liljas et al Second edition:

**Chapter 2** page 27-36

**Chapter 3** page 42-58

**Chapter 3** page 37-42

**Chapter 12** skip 12.2.2 – 12.2.2.3

**Chapter 5** skip 5.3.11.2

**Chapter 10**

**Chapter 4 and Chapter 13**

**Protein engineering** - not in the book

**Metals & cofactors** different pages in the book

**Chapter 15 and Chapter 16**

## Reading in Liljas et al First edition:

**Chapter 2** p11-40, skip 2.1.6.6., 2.1.6.7.  
Appendix B.2.1, B.2.1.1 (p496-500), Fig B.7 (p 503-505)  
Chapter 16; 16.4-16.4.1 p478-481.

**Chapter 9** 2.2.2  
2.2.4.1-2.2.4.2  
skip - 9.1.2.5-Hsp100  
skip - from 9.2.3.2 to the end  
Appendix A

**Chapter 3** skip - 3.4.7.6. (bracket notation)  
skip - 3.4.10.1. (tRNA)  
skip: 3.4.11.2.(P4 P6)

**Chapter 7** skip - 7.5.4, 7.5.5., 7.5.6.

**Chapter 10** Chapter + 2.1.6.7

**Chapter 11** skip 11.2 signaling by cytokines p369-377

**Protein engineering** - not in the book

**Metals & cofactors** Appendix E  
2.2.4.3. → end of chapter 2

**Chapter 12-13** Chapter 12  
Chapter 13 - only 13.1.1  
2.1.6.5→ 2.1.6.6  
2.2.3.3→