

## **Schedule: Applied Cell Biology, 7.5 hp, autumn 2020 (5MO012)**

**Course time:** November 2 to December 2, 2020. (13/10, 2020)

**Lecture halls:** Lecture hall 6A103 (“Astrid Fagreus salen”), located in building 6A close to the entrance of the Dept. of Immunology.  
Lecture hall Thymine / Uracil (T / U) – 6K148 (floor 1, Building 6L, in the Dept. of Molecular Biology)  
Lecture hall Old library / Guanine (OL / G) – 6K44 (floor 1, Building 6L, in the Dept. of Molecular Biology)

**Laboratories:** Student kitchens and localities for microscopy to be announced.

**Course leader:** Victoria Shingler (VS), [vicky.shingler@umu.se](mailto:vicky.shingler@umu.se)

**Laboratory instructor:** Martin Gullberg (MG), [martin.gullberg@molbiol.umu.se](mailto:martin.gullberg@molbiol.umu.se)

**Lecturer:** Martin Gullberg (MG), [martin.gullberg@molbiol.umu.se](mailto:martin.gullberg@molbiol.umu.se)

**Course secretary:** Ingela Nilsson. 090-785 28 69, [ingela.nilsson@umu.se](mailto:ingela.nilsson@umu.se)

**Literature/text book:** Alberts et al., Molecular Biology of the Cell, (5<sup>th</sup> or 6<sup>th</sup> edition)

### **Mandatory exercises:**

**I)** Calculation exercises for technical biologists. These exercises comprise 14 tasks, which are aimed to develop the ability to apply and integrate knowledge in several fields of natural science. As a preparation, student view the recorded lecture series “Cell biology by the numbers” by Ron Milo (Weismann Institute, Israel). Students may solve these tasks individually or as a group activity. Guidance will be provided by teachers at three scheduled occasions termed “flipped class room”.

**II)** Practical exercises. Students will learn how to culture yeast cells and how to analyze cell growth

### **The following rules apply to all mandatory activities of the course:**

- i)** In case of absence from a mandatory exercise, the student should notify the course leader as soon as possible. The reason for absence must to be stated in this mail.
- ii)** Provided that there is a valid reason (e.g. illness or something else that give the right for absence from an ordinary job), students will be given the opportunity to perform a complementary exercise within four weeks.
- iii)** Students must report by mail to the course leader the intention to participate in a complementary exercise.
- iv)** In case of discontinuation of the course; this should be reported to the course secretary.

### **Lecture handouts and mini-case questions** (based on materials originally produced by Dr. Per Holmfeldt)

Introduction to the course (6 figures)

**Lecture 1:** Cell biology – basic concepts (24 figures)

**Lecture 2:** Membrane biology and cellular organelles (30 figures)

**Lecture 3:** Cell organelles and intracellular trafficking (30 figures)

**Lecture 4 & 5:** Cellular communication part I & II (54 figures)

**Lecture 6 & 7:** Cell cycle and cell death part I & II (54 figures)

**Lecture 8 & 9:** Cytoskeleton part I & II (56 figures)

### **Lectures by Ron Milo (Weismann Institute, Israel): “Cell biology by the numbers”**

**Recorded lecture 1:** Quantitative reasoning in molecular and cell biology

**Recorded lecture 2:** Size, mass and geometry

**Recorded lecture 3:** Concentrations and absolute numbers

**Recorded lecture 4:** Energies and Forces

**Recorded lecture 5:** Rates and durations

### **Schedule** (Text in green: Scheduled activities related to laboratory activities)

*Italic text in purple: Scheduled activities related to Ron Milo lectures and practical calculation exercises*

**Abbreviations:** PowerPoint VR – PowerPoint Voice record files downloaded at **Cambro** (“Resources” / folder “Lectures“ / folder “Lectures Voice Record pptx files”)

**Locality:** TBA – Locality will be announced by mail and/or at Cambro

**Zoom** – Zoom meeting. Meeting ID will be announced by mail and/or at Cambro

### **Course week 1**

MON 2/11 **08.00-09.00 (Zoom):** Roll call. Introduction to theoretical and practical parts of the course.  
**09.00-11.00 (PowerPoint VR):** **Lecture 1** – Basic concepts in modern biology.

- 12.00-13.00 (PowerPoint VR):** *Introduction to lecture series “Cell biology by the numbers” and activities denoted “Flipped class room – calculation exercises for technical biologists”(MG)*  
**15.00-16.00 (Zoom):** Flipped class room – opportunity for questions and consultation  
**Unscheduled time:** *Watch Ron Milo, lecture 1: “Quantitative reasoning in molecular and cell biology”. Search YouTube: Ron Milo Cell Biology by the Numbers, 2014 class, Lecture 1*
- TUE 3/11 **08.00-11.00 (PowerPoint VR): Lecture 2 –** Membrane biology and cellular organelles  
**12.00-13.00 (Locality: TBA):** *Introduction to Lab 1: Isolation of yeast clones. Distribution of yeast strain, agar plates and other materials.*  
**13.00-14.00 (Zoom):** Flipped classroom - Repetition of basic concepts of modern biology  
**14.00-15.00 (Zoom):** Flipped classroom – *Consultation concerning Lab 1*  
**15.00 (locality: students own choice):** *Initiation of Lab 1*
- WED 4/11 **08.00-11.00 (PowerPoint VR): Lecture 3 –** Cell organelles and intracellular trafficking  
**12.00-16.00 (Zoom):** Debriefing of mini-cases - Repetition of basic concepts of modern biology  
*Flipped classroom: consultation concerning practical exercises*  
**Unscheduled time:** Prepare for case de-briefing
- THU 5/11 **13.00-15.00 (Zoom):** Question time, mini-cases week 1  
**Unscheduled time:** Prepare for case de-briefing
- FRI 6/11 **08.00-09.00 (locality: students own choice):** *Lab 1: Evaluation of plates with single cell streaks. In case of poor results, prepare single streaks on two new plates*  
**13.00-16.00 (Zoom):** De-briefing of mini-cases, week 1  
**Unscheduled time:** Prepare for case de-briefing / *watch Ron Milo lecture 2:*
- Course week 2**
- MON 9/11 **08.00-11.00 (PowerPoint VR): Lecture 4 –** Cellular communication I  
**12.00-13.00 (Locality: TBA)** *Introduction to Lab 2: Estimation of number of live yeast cells by viable count. Distribution of materials.*  
**14.00-15.00 (Zoom):** Flipped classroom – *Consultation concerning Lab 2*  
**15.00-17.00 (locality: students own choice):** *Initiation of Lab 2*  
**Unscheduled time:** Prepare for case de-briefing
- TUE 10/11 **08.00-11.00 (PowerPoint VR): Lecture 5 –** Cellular communication II  
**Unscheduled time:** Prepare for case de-briefing / *watch Ron Milo lecture 3*
- WED 11/11 **Unscheduled time:** Prepare for case de-briefing / *watch Ron Milo lecture 4 & calculation exercises, Task 1-4*
- THU 12/11 **13.00-15.00 (Zoom):** Question time, mini-cases week 2 & *calculation exercises, Task 1-4*  
**15.00-17.00 (locality: students own choice):** *Lab 2, scoring of plates used for viable count*  
**Unscheduled time:** Prepare for case de-briefing / *watch Ron Milo lecture 5*
- FRI 13/11 **14.00-17.00 (Zoom):** De-briefing of mini-cases, week 2  
**Unscheduled time:** Prepare for case de-briefing  
**17.00** Dead line report on Lab 1
- Course week 3**
- MON 16/11 **08.00-11.00 (PowerPoint VR): Lecture 6 –** Cell cycle I  
**13.00-14.00 (Zoom):** *Introduction to Lab 3: Monitoring growth and fermentation by brewer yeast.*  
**15.00-17.00 (Locality: TBA):** *Lab 3, initiation of lab: Inoculation, hydrometer measurement and microscopy.*
- TUE 17/11 **08.00-11.00 (PowerPoint VR): Lecture 7 –** Cell cycle II and cell death  
**12.00-13.00 (Zoom):** Flipped classroom – *Consultation concerning Lab 3*  
**14.00-17.00 (Locality: TBA):** *Lab 3, 24 h time point, hydrometer measurement and microscopy.*  
**24.00** Dead line report on Lab 1, Lab 2 (including “General questions concerning Disinfection and sterilization”)
- WED 18/11 **09.00-10.00 (Zoom):** *Session I: “Flipped class room” – calculation exercises, Task 1-4*  
**11.00-13.30 (Locality: TBA):** *Lab 3, 48 h time point, hydrometer measurement and microscopy.*

14.00-17.00 (PowerPoint VR): **Lecture 8** – Cytoskeleton I

**Unscheduled time:** Prepare for case de-briefing / *calculation exercises, Task 5-8*

THU 19/11 **11.00-13.30 (Locality: TBA): Lab 3, 72 h time point, hydrometer measurement and microscopy.**  
**15.00-17.00 (Zoom):** Question time, mini-cases week 3 and *calculation exercises, Task 5-8*  
**Unscheduled time:** Prepare for case de-briefing / *calculation exercises, Task 5-8*

FRI 20/11 **10.00-12.30 (Locality: TBA): Lab 3, 96 h time point, hydrometer measurement and microscopy.**  
**13.30-17.00 (Zoom):** De-briefing of mini-cases, week 3  
**Unscheduled time:** Prepare for case de-briefing / *calculation exercises, Task 5-8*

#### Course week 4

MON 23/11 **09.00-12.00 (PowerPoint VR): Lecture 9** – Cytoskeleton II (MG)  
**13.00-15.00 (Zoom):** *Session II: “Flipped class room” – calculation exercises, Task 5-8*  
*Lab 3, consultation on how to write the report*  
**Unscheduled time:** *calculation exercises, Task 9 – 13*

TUE 24/11 **14.00-15.00 (Zoom): Consultation: guidelines concerning suitable topics for a vignette**  
**Unscheduled time:** Prepare for case de-briefing / *calculation exercises, Task 9-13, and vignette*

WED 25/11 **17.00** Dead line: report on Lab 3  
**Unscheduled time:** Prepare for case de-briefing / *calculation exercises, Task 9-13, and vignette*

THU 26/11 **09.00-11.00 (Zoom): Session III: “Flipped class room” – calculation exercises, Task 9-13**  
**13.00-15.00 (Zoom):** Question time, mini-cases, week 4  
**Unscheduled time:** Prepare for case de-briefing / *calculation exercises, Task 9-13, and vignette*

FRI 27/11 **13.00-17.00 (Zoom):** De-briefing of mini-cases, week 4  
**Unscheduled time:** Prepare for case de-briefing / *calculation exercises, Task 9-13, and vignette*

#### Course week 5

MON 30/11 **13.00-15.00 (Zoom):** Time for review of course content and questions  
**Unscheduled time:** Prepare for exam /*calculation exercises and vignette*

TUE 1/12 **Unscheduled time:** Prepare for exam /*calculation exercises and vignette*

WED 2/12 **09.00-15.00 (Locality????) Theoretical Exam () Re-exam, ????)**  
**17.00** Dead line: *Report on calculation exercises for technical biologists & vignette*