Introduction to the molecular mechanisms of cell function in the context of cutting-edge applications in bioengineering and medicine. Biological concepts include: molecular building blocks, energetics, reaction kinetics, nucleic acids and DNA repair, transcription, translation, regulation and cytoskeleton. Applications include bioenergy, biommanufacturing, antibiotics, diabetes, protein therapeutics, gene circuit engineering, & tissue engineering. Quantitative principles, computational methods, and experimental methods will be integrated into lectures and labs.

LECTURE/SEMINAR/EXAMINATION

Required Text: Essential Cell Biology, B. Alberts et. al. 2009
Tuesday 11.10 am–3 pm (auxiliary date: even weeks: Friday 9 am-2 pm)

Location (see map)
Room 108b: Building 40, Dekanatsgebäude; Hörsaal 2(HS2): Building 91, MTZ

Examination/Grading: Active Attendance / Written (different formats: MC-, open questions, etc.)
  Exam Seminar 1: 24%
  Exam Seminar 2: 32%
  Exam Laboratory: 7%
  Final Exam: 27%
  Active Attendance: 10%

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<th>Week</th>
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| April
| 15   | Tue 08 | CH1 (9) + CH2 (24)                        | 108b |
| 16   | Tue 15 | CH3 (16/1) + CH4 (24/4)                    | 108b |
| 17   | Tue 22 | CH5 (15/2) + CH6 (33/7)                    | HS2  |
| 18   | Tue 29 | **EXAM SEMINAR 1: CH1-6**                 |      |
| May
| 19   | Tue 06 | CH7 (38/7) + CH8 (20/3)                    | 108b |
| 20   | Tue 13 | CH9 (17/0) + CH11 (38/3)                   | 108b |
| 21   | Tue 20 | CH12 (25/6) + CH 13 (12/2) + CH14 (19/4)   | 109b |
| 22   | Tue 27 | **EXAM SEMINAR 2: CH7-14**                | 108b |
| 22   | Fri 30 | CH15 (22/3) + CH16 (32/3)                  | 108b |
| June
| 26   | Tue 24 | CH17 (25/5) + CH18 (21/5)                  | 108b |
| July
| 27   | Tue 01 | CH19 (15/1) + CH20 (29/4)                  | 108b |
| 28   | Tue 08 | **FINAL LABORATORY**                      | 108b |
| 29   | Tue 15 | FINAL EXAM: CH15-20                       | 108b |
Labs will provide practical experience with current methods used in molecular/cell biology and biotechnology. The first half of the course will cover protein folding, bioenergetics, cell growth, and microscopy. The second half will be devoted to a single multi-week module on genetic engineering and gene regulation. Students will build a bacterial gene expression system, learning recombinant DNA technology, cloning and gene expression measurement techniques. Labs will emphasize the experimental and analytical skills required in modern engineering and scientific research.

**LABORATORY**

**Required:** Laboratory Manual – White Lab coat  
**Tuesday:** 3.00 pm – 6.00 pm  
**Location:** MTZ, Fiedlerstrasse 42 (map: Bld. 91)  
**Examination/Grading:** Active Attendance / Written  
  - Exam Seminar 1: 24%  
  - Exam Seminar 2: 32%  
  - Exam Laboratory: 7%  
  - Final Exam: 27%  
  - Active Attendance: 10%

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<th>Day</th>
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<th>Discipline</th>
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<th>Location</th>
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| April 08 | **Laboratory 1**  
Analysis of Simulated Epidemic and Hand Contamination and Cytological Studies | Microbiology                    | Prof. Jacobs   | Mikroskopiersaal                       |
| April 15 | **Laboratory 2**  
General Histology                                                           | Anatomy                         | Prof. Kasper   | Mikroskopiersaal                       |
| April 22 | **Laboratory 3**  
Quantitative Determination and Spectrums of Haemoglobins in Blood         | Biochemistry                    | Dr. Hempel     | Institut für Physiologische Chemie     |
| April 29 | **Laboratory 4**  
Determination of Activity of Lactate Dehydrogenase in Optical Test         | Biochemistry                    | Dr. Hempel     | Institut für Physiologische Chemie     |
| May 06   | **Laboratory 5**  
Molecular Biological Diagnosis of Cystic Fibrosis with the Help of PCR     | Biochemistry                    | Dr. Kreutzmann | Institut für Physiologische Chemie     |
| May 13   | **Laboratory 6**  
Characterization of DNA using Restriction Endonucleases                    | Biochemistry                    | Dr. Kreutzmann | Institut für Physiologische Chemie     |
| May 20   | **Laboratory 7 – Group I**  
Bacterial Transformation                                                     | Immunology                      | Prof. Roers    | Institut für Immunologie               |
| May 27   | **Laboratory 7 – Group II**  
Bacterial Transformation                                                     | Immunology                      | Prof. Roers    | Institut für Immunologie               |
| June 03  | **Laboratory 8 – Group I**  
Plasmid Preparation from *E. coli* and Sequencing of Plasmid DNA            | Immunology                      | Prof. Roers    | Institut für Immunologie               |
| June 17  | **Laboratory 8 – Group II**  
Plasmid Preparation from *E. coli* and Sequencing of Plasmid DNA            | Immunology                      | Prof. Roers    | Institut für Immunologie               |
| June 24  | **Laboratory 9 – Group I**  
Transient Transfection of Eukaryotic Cells  
Western Blotting Technique                                                   | Immunology                      | Prof. Roers    | Institut für Immunologie               |
| July 01  | **Laboratory 9 – Group II**  
Transient Transfection of Eukaryotic Cells  
Western Blotting Technique                                                   | Immunology                      | Prof. Roers    | Institut für Immunologie               |