Slides used by the lecturers are online as pdf files and mostly in German (http://www.genzentrum.lmu.de/lehrplan/)

Biochemistry 1 – Introduction and Biochemistry of cellular processes
Each topic a 90 min lecture

- Overview and basics
- Carbohydrates
- Nucleic acids
- Proteins
- Lipids and membranes, compartments and transport
- DNA replication
- Chromatin structure
- Transcription
- Translation
- Protein transport
- Cytoskeleton, cell cycle
- Signal transduction

Biochemistry 2 – metabolism
Each topic a 90 min lecture

- Introduction, enzymes (Stryer ch. 7 – 10)
- Enzyme kinetics (Stryer ch. 8)
- Energy and co-factors (Stryer ch. 15.2, 15.3)
- Gycolysis, gluconeogenisis (Stryer ch. 16)
- Citrate cycle (Stryer ch. 17)
- Oxidative phosphorylation (Stryer ch. 18)
- Photo synthesis (Stryer ch. 19,20)
- Metabolism of fatty acids (Stryer ch. 22)
- Phospholipids, cholesterol (Stryer ch. 12,13, 26)
- Metabolism of amino acids (Stryer ch. 23)
- Synthesis and degradation of nucleotides (Stryer ch. 25)
- Development of drugs
- System biology of the metabolism (Stryer ch. 27)

Biochemistry 3 – macromolecules
Each topic a 90 min lecture

- Protein structure
- Allostry and cooperativity
- Enzyme kinetics
- Enzyme catalysis
- Enzyme classification
- Structure of nucleic acids
- Catalysis of nucleic acids
- Protein-nucleic acid interaction
- Membrane proteins
- Molecular machines
- Protein-protein interaction
- Protein engineering

Biochemistry 4 – extracellular matrix, signal transduction and cell cycle
Each topic a 90 min lecture

- Introduction: Internal organization of cells
- Membrane biology: Lipid bilayer, Membrane proteins
- Membrane biology: Transport across and electrical properties
- Mitochondria/Chloroplasts: as organelles / transport to and fro
- Compartments and Protein Sorting: nucleus, ER, Golgi
- Endocytosis: recycling, lysosomes
- Cell communication: general principles
- Cell communication: RTK
- Cell communication: GPCR
- Cell communication
- Cytoskeleton/motors: actin
- Cytoskeleton/motors: microtubules
- Intracellular transport
- Cell cycle: Regulation by cyclins
- Cell cycle: Checkpoints
- Cell cycle: Mitosis and Cytokinesis
- Cell death: Regulation and cellular events
- Cell junctions and adhesion
- Cell-substrate adhesion: ECM, Integrins
- Cell polarity
- Cell migration: Substrate, force generation
- Axon guidance

Molecular Genetics
Each topic a 90 min lecture
Graw and Knippers are standard genetic text books; chapter reference refers to the German versions

- Genetic material in bacteria, bacterial chromosomes, plasmids, phages, restriction enzymes, CRiSPER/CAS-system (Graw capter 4, Knippers capter 5)
- Use of micro organisms to change foreign genes, genome libraries, BAC/PAC/YAC, classical cloning, recombineering, gateway-system, transposon mutagenesis in bacteria (Graw 4, 8 Knippers 10, 8)
- Using PCR for gene modification, advanced PCR methods, point mutagenesis (Graw 5, Knippers 5)
- How to clone – strategies and procedures (examples), data bases, software tools, gene synthesis
- Genetic interactions using yeast as an example, basics of interaction screens, yeast as a model organism (yeast two hybrid)
- Advanced genetic interaction screens, RNA interference as screening tool, high copy suppressor, robotic synthetic lethal, RNAi as screening tool in Drosophila and human/mouse
- Gene transfer in eukaryotic cell transfection, retrovirus, transposon/SV40-episomes, specific recombinases, targeting soma or germline (transgenic organisms), agro bacteria as vector for plants, gene therapy (Graw 9, Knippers 8)
- Gene expression in eukaryotic cells, conditional constructs (LoxP, FLP/FRT…), UAS-Gal4, differentiation – irreversible commitments to limited gene expression (Knippers 13)
- Transcriptomic states of a cell described using transcripts (Knippers 17)
- Genomic I – comperative genomic and evolution
- Genomic II – SNPs, GWAS (genome wide association studies) personal genome (Graw 10, 12, Knippers 17)
- Epigenetic chromatin structure, remodeling, genetic imprinting (Graw 11, Knippers 18)

Methods in Biochemistry 1
Each topic a 90 min lecture

- Introduction; Preparation & Isolation of Nucleic Acids
- Preparation & Isolation of Nucleic Acids (ff)
- Detection of Nucleic Acids in vitro & in vivo; Structure and Identification of Macromolecules
- Analysis of the Interactions of Macromolecules in vitro & in vivo; RNA Analysis
- Isolation and purification of proteins
- Protein analysis by Biophysical and Biochemical methods
- Structure analysis
- Functional analysis

Methods in Biochemistry 2
Each topic a 90 min lecture

- Mass spectroscopy
- Protein-protein-interaction
- Quantitative methods of protein analysis
- Global analysis / proteomics
- Nucleic acids
- Spectroscopy

Biochemistry practical course 1

- Enzyme kinetics (Michaelis-Menten, inhibitors, influence of salt, temperature, pH of enzyme activity)
- DNA analysis (isolation of genomic DNA from yeast and mouse tissue, plasmid isolation, restriction analysis of genomic and plasmid DNA, transformation of bacteria, PCR)
- Protein analysis (protein expression in E. coli, induced protein expression, protein purification, SDS-page, protein quantification)

Biochemistry practical course 2

- Protein purification and characterization
- Protein folding and miss-folding in vitro and in vivo
- RT-PCR, purification of mRNA, purification of protein complexes, reportergene (beta-galactosidase) assays