CRC 1093 Practical Courses

All Graduate Students within the CRC can participate in practical training courses or scientific work in another laboratory, in order to learn new experimental methods or techniques.

It is recommended that the practical course or lab exchange is done within the first two years during PhD work so that you can benefit from them for your own experimental studies.

Below the information about the different practical courses are listed in detail:

Organizational Remarks

- Please discuss with your supervisor, what kind of Practical Course/Lab Exchange would be helpful for your own PhD research project.

- Please contact the Principal Investigator, where you want to do a Practical Course and ask, when you could join the group.

- Please tell the CRC-Office when and where you will do a Practical Course.

- After the course the successful participation will be certificated. Please contact the CRC-office.

Pro-ject	Personal Investigator	Titel of Practical Course or Lab exchange Program	Short Description	Date / Agreement	No. of Participants
A1	Schmuck	**Solid phase synthesis**	(also microwave-assisted), high-throughout screening of combinatorial libraries, synthesis and screening of dynamic combinatorial libraries. The participants of the course will synthesize a small split-mix library of peptides using solid phase peptide synthesis. This library will then be screened on bead for its binding affinity to a given protein. The identified hits will be resynthesized in larger amounts using microwave assisted peptide synthesis and their binding studies will be evaluated in more detail.	Any time upon agreement	Max. 4 people per course.

CRC 1093 Practical Courses

A2	Kaiser	**Proteomics**	Chemical synthesis of bioreactive probes, chemical proteomics (including sample preparation, in vitro/vivo labeling, mass spectrometry). The participants will generate a chemical probe and will use it in a “standard” chemical proteomics workflow.	Any time upon agreement	Max. 2 people per course
A3	Schrader	**Biophysical affinity determination**	ITC titrations, fluorescence titrations, NMR titrations. The participants will carry out and evaluate various methods of affinity determination on protein-ligand and peptide-ligand complexes, which offer diverse information on the binding process: an ITC titration (stoich. + ΔG, ΔH, ΔS), a fluorescence titration (stoich +, Kd), and an NMR titration (stoich. + Kd, complexed region). The scope and limitations (e.g., concentration ranges) will be discussed.	Twice a year, during the lecture-free time, upon agreement	Max. 3 people per course
A5	Epple	**Synthesis and characterization of inorganic nanoparticles, loaded with biomolecules**	Methods: dynamic light scattering, disc centrifugal sedimentation, scanning electron microscopy. The participants of the course will learn how to prepare and to characterize inorganic nanoparticles which are loaded with biomolecules. Modern characterization methods will be applied. Cell uptake studies with fluorescing model compounds will be presented (note that it will not be possible to carry out cell culture experiments by the participants due to safety regulations, but it will be possible to watch during all steps how cells are cultured, how nanoparticles are taken up and how this is monitored in the fluorescence microscope.	Twice every year in March and in October; further courses if sufficiently high demand; duration 1 week;	Max. 3 per course due to restricted space
A6	Sacca	**DNA origami structures**	Design of simple planar DNA origami, self-assembly of DNA origami, AFM characterization	on previous agreement	Max. 4

A7	Hoffmann	**Bioinformatics methods, statistical methods, biomolecular modeling methods**	Students are guided in the solution of problems from their respective projects using computational methods	In semester breaks by agreement	Max. 2
A8	Sanchez	**Introduction to computational methods for biological systems**	The students will be introduced to the basics of computational techniques that can be applied to their own projects: molecular dynamics simulations, enhanced sampling approaches and multi-scale methods, among others.	1 week upon previous agreement	Max. 2
A9	Schlücker	**Surface-enhanced Raman spectroscopy**	The Schlücker lab organizes the one-day method course "Optical spectroscopy on functionalized noble metal nanoparticles" as an introduction into the emerging field of Nano(bio)photonics. The graduate students of the CRC learn about the synthesis and optical properties of gold nanoparticles. Spectroscopic techniques such as UV/Vis extinction and surface-enhanced Raman spectroscopy (SERS) are applied for the characterization of metal colloids. This provides theoretical and experimental insights into the chemistry and physics of plasmonic nanoparticles.	According to prior agreement	Max. 4
A10	Voskuhl	**Synthesis and characterisation of novel luminophores with aggregation induced emission properties**	The Voskuhl lab works in the field of novel applications of luminophores with aggregation induced emission properties. To this end we are able to measure fluorescence and absorption spectra as well as quantum efficiencies. These techniques can be learned in our group.	According to prior agreement	Max.2
A11	Hartmann	**Precision macromolecules and polymers**	Solid phase synthesis of peptides and Oligo(amidoamines), analytics of Ligand-Receptor-Interaction with surface plasmon resonance (SPR), Analytics and purification of macromolecules with HPLC and GPC.	According to prior agreement	Max. 2

CRC 1093 Practical Courses

B1	Ehrmann	**Recombinant expression and protein purification in *E coli***	PCR cloning, expression, protein purification and enzyme assays *a 2 week course 9-16h*	Course takes place in March each year	5 each
B2	Meyer	**Protein interaction studies in mammalian tissue culture cells**	Cloning of mammalian expression constructs. transfection, coIP, gel filtration, western blot analysis	According to prior agreement	Max. 2
B4	Ottmann	**Biophysical analysis of protein-protein interactions**	In this course you will learn the basic principles and practice the application of biophysical methods like Surface Plasmon Resonance (SPR), Isothermal Titration Calorimetry (ITC) and a number of plate-reader based methods (FP, HTRF, AlphaScreen) to analyze Protein-Protein Interactions.	Flexible on agreement	Max 3
B5	Knauer	**Microinjection and (confocal) fluorescence microscopy**	In this practical course you will learn basic handling of a conventional fluorescence microscope. Successful microinjection of recombinant proteins into living cells will be monitored by live cell imaging. Additional, an introduction into basic confocal microscopy can be offered. Both modules can be attended separately.	no fixed date - flexible scheduling of appointment	Max. 3
B6	Musacchio	**Protein expression in prokaryotic and eukaryotic hosts - a primer on protein purification techniques**	In this course students may learn basic principles of recombinant protein expression in bacterial and insect cell hosts, including construct design for commonly used expression vector backbones. The course will also focus on common methods of macromolecular purification, including affinity, ion exchange, and size-exclusion chromatography and basic biochemical techniques.	According to prior agreement	Max. 3
B7	Westermann	**Primer on genetic manipulation and analysis of the budding yeast *Saccharomyces cerevisiae* - a classic**	Participants will learn fundamental techniques required to perform genetic manipulations in budding yeast. This includes design of integration constructs, generation of knock-out alleles and creation of fusion proteins. Strategies for analysis of growth phenotypes, protein-	Date upon previous agreement	Max.2

		eukaryotic model organism	protein interactions and cell cycle progression will be covered as well.		
Z2	Vetter	**Macromolecular X-ray structure analysis**	Description: Participants will learn how to grow protein crystals, prepare the crystals for data collection by fishing them from the setup plates and freezing them in liguid nitrogen, and mounting them on the in-house rotating anode X-ray generators. Data processing and the solution of the "phase problem" of crystallography will be touched briefly, followed by an introduction into building of the protein structure into the measured electron density with the help of the graphics program "coot" and refinement of the model using the "CCP4 program suite". Analysis and interpretation of the model and of structures in the protein structure database ("PDB") in general will conclude the course.	Date: on previous agreement	Max. 3 per course
Z3	Bayer	**Protein-NMR**	In this course you will learn the basic principles and practice the application of protein based NMR, uses of NMR-buffers, titration of ligands, 2D- and 3D-spectra and backbone-assignment.	Flexible on agreement with Dr. Christine Beuck	Max. 2