Title of module	Modular Advanced Practical and Seminar in the Focal Point Programme "Proteins: Structure and Function" VZ: 185750, 183751 **"Expression, Purification and FTIR spectroscopic investigation of small GTPases"**

Credit points	4	***Available in semester(s)***	1
Hours per week	5.25	***Compact course***	☒

Lecturer(s)	PD Carsten Kötting
Teaching methods	two weeks advanced laboratory course with a seminar, one of four lab courses to be completed in the first term
Evaluation of learning progress	active participation in the laboratory tasks and seminar, feedback during the experiment
Mode of examination	Active and successful participation in the practical and the written project report (90%) and talk in the seminar
Learning objectives	Basic practical skills in the heterologous expression and purification of a small GTPase from *E. coli*. Time-resolved FTIR difference spectoscopy. Reaction mechanism of proteins.
Soft skills	collaboration in a small team of 2-3 students and interaction with the members of a research laboratory, presentation of results (oral and written).

Contents of module	a. safety instructions b. practical course - heterologous expression of a GTPase of the Ras superfamily - purification of the protein by ion exchange, gelfiltration and or affinity chromatography - nucleotide exchange from GDP to caged-GTP, control of the exchange by HPLC - start of the reaction by an XeCl excimer laser flash and time resolved FTIR of the purified protein - discussion of the obtained infrared spectra and kinetics c. seminar protein expression and isolation FTIR difference spectroscopy of proteins discussion of the results (Note that this outline is an example, the actual content can vary)