Module Name
Posttranslational Regulation of Proteins

Type of Module	**Module Code**
o Advanced Module	Posttranslational Regulation

Identification Number	**Workload**	**Credit Points**	**Term**	**Offered Every**	**Start**	**Duration**
MN-B-SM (G 2)	360 h	12 CP	2nd term of studying	Summer term, 1st half	Summer term only	7 weeks

1	**Course Types**	**Contact Time**	**Private Study**
	a) Lectures	20 h	30 h
	b) Practical/Lab	150 h	126 h
	c) Seminar	10 h	24 h

2 Module Objectives and Skills to be Acquired

Students who successfully completed this module

- have gained in-depth knowledge in protein research and the role of posttranslational regulation of protein activity, localization, stability and interaction properties.
- have acquired experimental skills in state-of-the art methods in cell biology and molecular biology (see contents of the module) and are able to independently design and perform small scientific projects related to topics of the module.
- have learned how to present research results in oral and written form and to critically discuss scientific publications related to the topic of the module on a professional level.
- are able to transfer skills acquired in this module to other fields of biology.

3 Module Content

- Principles of posttranslational regulation, and how they impact protein activity, localization, stability and interaction pattern
- Enzymes involved in protein modification ('writers'), and de-modification ('erasers')
- Recognition factors for posttranslational modifications ('readers')
- Structural biology of protein modifications
- Role of protein modifications in the regulation of the cell cycle, DNA integrity, vesicular trafficking, and other processes in cell biology
- Protein modification pathways as drug targets
- Major protein modification systems: phosphorylation, ubiquitination, SUMOylation, acetylation, lipidation, glycosylation and others
- Experimental techniques for studying protein modification (in vitro modification/de-modification assay, identification/isolation of modification and de-modification enzymes, identification of modification substrates, modification-dependent protein binding)
- Bioinformatical methods for predicting and understanding modification sites and components of the modification system.
- Understanding and working with databases of protein modification sites and patterns

3	**Module Content** (continued) • The role of Mass Spectroscopy in the large-scale identification of protein modifications • Protein analysis and protein-interaction methods (Western blotting, co-immunoprecipitation of proteins, pull-down, etc.) *Explanatory note*: The list above comprises techniques that are commonly used in the participating group. Thus, every student will be confronted with a large subset of it. The exact content, however, will depend on the tutor and the research project the student will work on.
4	**Teaching Methods** • Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form
5	**Prerequisites (for the Module)** Enrollment in the Master's of Science degree course "Genetics and Biology of Aging and Regeneration" or in the Master's degree course "Biochemistry and Molecular Medicine" **Additional academic requirements** Previous attendance of the lecture module Principles of Molecular Genetics, Development and Aging; Solid skills concerning laboratory work are indispensable for participation in this module.
6	**Type of Examination** The final examination consists of two parts: One hour written examination on topics of lectures, seminars and the practical/lab part (50 % of the total module mark), oral presentation (20-30 min; 50 % of the total module mark)
7	**Credits Awarded** Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)
8	**Compatibility with other Curricula*** Optional compulsory module in the Master's degree course "Biochemistry and Molecular Medicine"
9	**Proportion of Final Grade** 12.0 %
10	**Module Coordinator** Prof. Dr. Kay Hofmann, phone 470 1701, e-mail: kay.hofmann@uni-koeln.de
11	**Further Information** **Participating faculty:** Prof. Dr. J. Dohmen, Dr. M. Escobar-Henriques, Prof. Dr. K. Hofmann, Dr. K. Klopffleisch, Prof. Dr. M. Krüger, Dr. G. Praefcke, PD Dr. Tobias Steinfeldt **Literature:** • Information on recommended textbooks and other reading material will be given on the ILIAS representation of the course (see https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html) **General time schedule:** Week 1-5 (Mon.-Fri.): Lectures, practical/lab and preparation for the seminar talk (topic and date will be arranged individually); Week 6 (Mon.-Fri.): Seminar talks; Week 7 (Mon.-Fri.): Preparation for the written examination

11	**Further Information** (continued) **Note:** The module contains hand-on laboratory work conducted individually and is taught in research laboratories. The module contains computer-based practicals/research as a main component. **Introduction to the module:** April 13, 2026 at 10:15 a.m., Center for Molecular Biosciences (COMB), Room 4.32 (4th floor). **Written examination:** June 05, 2026, second/supplementary examination August 14, 2026; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.