załącznik do Regulaminu programu „visiting lecturers”

Osoba zgłaszająca z PW	
Tytuł i stopień naukowy	Prof. dr hab. inż.
Imię i nazwisko	Kamil Wojciechowski
Wydział	Chemiczny
Mail w domenie PW	kamil.wojciechowski@pw.edu.pl
Telefon kontaktowy	507321724

Propozycja osoby zgłaszanej jako visiting lecturers	
Tytuł i stopień naukowy	Dr hab.
Imię i nazwisko	Reinhard Miller
Dokładna afiliacja	Institute for Condensed Matter Physics, Darmstadt Technical University, Germany
Mail kontaktowy	reinhard.miller@pkm.tu-darmstadt.de
Opis osiągnięć (1/2-1 strony)	Reinhard Miller studied Mathematics at University of Rostock (1969-1973) and Colloid Chemistry at the Technical University Dresden (1977-1978), Germany. He got his PhD in 1978 and Habilitation in 1988, both at the Academy of Sciences in Berlin, Germany, on problems of adsorption kinetics and dilational visco-elasticity of surfactant adsorption layers. From 1992 until 2015 he worked as Group-Leader at the Max Planck Institute for Colloids and Interfaces in Potsdam/Golm in the field of thermodynamics, kinetics and mechanics of surfactant and protein adsorption layers at liquid-fluid interfaces. 2015-2019 he was Senior Scientist at the same Max Planck Institute for Colloids and Interface, and since 2020 Dr. Miller is Associate Senior Scientist in the Institute for Soft Matter Physics at the Technical University Darmstadt. Reinhard Miller was editor of the Elsevier Monograph Series "Studies in Interface Science", in 1995-2008 (25 Volumes). He is presently Editor of the book series with Taylor and Francis “Progress in Colloid and Interface Science” (so far 7 Volumes). Since 1998, he is editor of the Elsevier journal “Advances in Colloid Interface Science” (IF = 15.9) and since 2008 Section Editor of the Elsevier journal “Current Opinion in Colloid and Interface Science” (IF = 7.9). Since 2017, he acts as Editor-in-Chief of the MDPI journal “Colloids & Interfaces” (IF = 2.5).

	Dr. Reinhard Miller was President of the “European Colloid and Interface Society” ECIS (2012-2014) and President of the “International Association of Colloid and Interface Scientists” IACIS (2015-2018). His scientific interests are dynamics and mechanics of liquid interfaces, thermodynamics of adsorption of surfactants, proteins, polymers, particles and their mixtures, interfacial interactions and 2D shear and dilational rheology, formation and stability of foams and emulsions. He published about 700 papers in referenced journals (Web of Science), about 50 chapters in books, and about 50 contributions to printed conference proceedings. His h-index is 69 (Web of Science), 71 (Scopus) or 85 (Google Scholar); ORCID: 0000-0001-8943-7521.

Code of the course	4606-VP-ES-00006	Name of the course	Polish	**Kropelki i Bąbelki – wprowadzenie do koloidów i fizykochemii granic faz**	
			English	**Drops and Bubbles – an introduction to colloids and interface science**	
Type of the course	Specialty subject				
Course coordinator	Dr hab. Reinhard Miller	Course teacher	Dr hab. Reinhard Miller		
Implementing unit	Faculty of Chemistry	Scientific discipline / disciplines*	Chemical Sciences, Biotechnology, Physical Sciences, Chemical Engineering, Biomedical Engineering, Materials Engineering		
Level of education	Doctoral studies	Semester	November-December 2024		
Language of the course	English				
Type of assessment	Oral assessment	Number of hours in a semester	45	ECTS credits	4
Minimum number of participants	10	Maximum number of participants	20	Available for students (BSc, MSc)	Yes

Type of classes		Lecture	Auditory classes	Project classes	Laboratory	Seminar
Number of hours	in a week					
	in a semester	30			5	10

* does not apply to the Researcher’s Workshop

1. Prerequisites

The course is designed for graduate and PhD students from different fields giving insight into the theoretical and experimental possibilities for understanding liquid interfaces and their role in modern technologies, such as applications in foam and emulsion problems.

2. Course objectives

Interfaces are involved in all modern technologies based on liquids. This is in particular important in foamed systems or emulsions. In most applications, stable systems are required, although destabilization is in some cases required when for example foams or emulsions are unwanted. This is the case for example with foams in lakes and rivers caused by sewage or biosurfactants, or with emulsions in the petrochemistry to separate water from oil.

By the addition of surface active compounds, such as surfactants, polymers, proteins, particles or their mixtures, the properties of liquid interfaces can be modified. These substances do not only reduce the interfacial tension, but they can also provide visco-elastic properties to the interfaces, which can be important for the stabilization of foams and emulsions against coalescence.

The series of lectures aims at giving an introduction into the structure of surfactants and proteins, and their ability to adsorb at interfaces. The adsorption of molecules and particles is a time process which will be described by theoretical models as well as studied by suitable experiments. In particular various types of tensiometric methods are discussed. This includes classical techniques like ring and plate tensiometry, but also most advanced methods like capillary pressure and drop profile tensiometry. In laboratory work, simple experiments are performed as case studies, in order to determine basic properties of pure liquids and of surfactant solutions, and simple protocols for the data analysis are discussed.

3. Course content (separate for each type of classes)
Lecture
• Adsorption dynamics and thermodynamics: historical aspects, physical description and corresponding theoretical models, experimental tools • Peculiarities of water/oil interfaces: molecular transfer across interfaces, partitioning • Interfacial mechanical properties: fundamentals of dilational and shear rheology, viscoelasticity experiments with surfactants and polymers • Applications: foam formation, emulsification, stability of disperse systems • Construction and use of simple tensiometers: drop volume, drop profile, plate tensiometers
Seminar
• analysis of experimental adsorption data
Laboratory
• Interfacial mechanical properties: fundamentals of dilational and shear rheology, viscoelasticity experiments with surfactants and polymers • Applications: foam formation, emulsification, stability of disperse systems

4. Learning outcomes			
Type of learning outcomes	Learning outcomes description	Reference to the learning outcomes of the WUT DS	Learning outcomes verification methods*
Knowledge			
K01	global achievements covering theoretical foundations and general issues, as well as selected detailed issues in the field of fluid-fluid interfaces and colloid science.	SD_W2	active participation during classes, oral test
K02	the main development trends of the colloids and interfaces science with the related research methodology	SD_W3	active participation during classes, oral test
K03	basic principles of knowledge transfer related to colloids and interfaces to the economic and social field, as well as commercialization of the results of scientific activity and know-how	SD_W5	active participation during classes, oral test

	related to these results, including protection of intellectual property issues, also in open access		
Skills			
S01	utilize knowledge from the field of colloids and interfaces to creatively identify, formulate, and innovatively solve complex problems or perform research tasks, in particular: • define the purpose and subject of research, formulate a research hypothesis; • develop research methods, techniques and tools and use them in a creative way; • infer on the basis of the research results	SD_U1	active participation during classes, report evaluation
S02	perform critical analysis and evaluation of the results of research in the field of colloids and interfaces, expert works, and other creative activities, as well as their contribution to the development of knowledge, in particular - evaluate usefulness and the ways to use the results of theoretical works in practice	SD_U2	active participation during classes, report evaluation
Social competences			
SC01	critically assess the achievements in the field of colloids and interfaces and own contribution to the development of this discipline.	SD_K1	active participation during classes

*Allowed learning outcomes verification methods: exam; oral exam; oral test; project evaluation; report evaluation; presentation evaluation; active participation during classes; homework; tests

5. Assessment criteria
At the end of the course there will be an individual oral assessment

6. Literature
Primary references:
[1] Surfactants - Chemistry, Interfacial Properties, Applications
„Studies in Interface Science“ – Vol. 13
V.B. Fainerman, D. Möbius and R. Miller (Eds.), Elsevier, Amsterdam, 2001
ISBN: 0-444-50962-3
[2] Surfactants: In Solution, at Interfaces and in Colloidal Dispersions
Bob Aveyard
ISBN: 9780198828600, October 2019

7. PhD student’s workload necessary to achieve the learning outcomes**		
No.	Description	Number of hours
1	Hours of scheduled instruction given by the academic teacher in the classroom	45
2	Hours of consultations with the academic teacher, exams, tests, etc.	15

3	Amount of time devoted to the preparation for classes, preparation of presentations, reports, projects, homework	20
4	Amount of time devoted to the preparation for exams, test, assessments	20
	Total number of hours	**100**
	ECTS credits	**4**

** 1 ECTS = 25-30 hours of the PhD students work (2 ECTS = 60 hours; 4 ECTS = 110 hours, etc.)

8. Additional information	
Number of ECTS credits for classes requiring direct participation of academic teachers	2
Number of ECTS credits earned by a student in a practical course	2