Modulbezeichnung:	**Seminar: Laser matter interaction (PS LaserMatters)**	**5 ECTS**
	(Seminar: Laser matter interaction)	
Modulverantwortliche/r:	Peter Hommelhoff	
Lehrende:	Peter Hommelhoff	

Startsemester: WS 2020/2021	Dauer: 1 Semester	Turnus: unregelmäßig
Präsenzzeit: 30 Std.	Eigenstudium: 120 Std.	Sprache: Deutsch oder Englisch

Lehrveranstaltungen:

Physics Seminar: Laser matter interaction (WS 2020/2021, Hauptseminar, 2 SWS, Peter Hommelhoff)

Inhalt:

We will discuss current research topics around the interaction of laser light with matter. Topics span a large range related to most modern research topics. For example. we may ask (and answer) the question "How fast does the photoeffect take place" (in less than 100 attoseconds - measured in 2018), or look into future schemes of particle acceleration with the help of laser light. In addition, we will delve deep into the realm of nonlinear light matter interaction and will discuss the so-called strongfield regime, which includes attosecond physics. We will also look into the basics of all of this, namely the generation of laser pulses, the coherent interaction of light with atoms and matter, which leads right away to (in the future: optical) atomic clocks and quantum information, but may also look into particle trapping and quantum mechanically-enhanced electron microscopy. Topics could include (potential - can alsp be changed or merged per student request):

- Optical Resonators and Lasers
- Optical Bloch equations
- Non-linear optics
- Femtosecond lasers: mode coupling
- Measurement of fast processes & laser pulses
- Frequency comb: carrier-envelope phase control
- (Optical) atomic clocks with frequency combs
- High Power Lasers
- From the photoelectric effect to multiphoton physics
- High harmonic and attosecond pulse generation
- Applications and examples for higher harmonics
- Terahertz radiation generation and application
- Laser-plasma-based electron acceleration
- Electron acceleration at photonic nanostructures
- Nanoplasmonics
- Strong field physics in solids
- Quantum path interference in multicolor experiments
- Landau-Zener-Stückelberg interferometry
- Diamond: a very special electron emitter
- Interaction-free measurements
- Electron holography
- Matter wave interference
- Charged particle trapping

Lernziele und Kompetenzen:

Learning goals and competences

Students

- comprehend an interesting physical topic in a short time frame
- identify and interpret the appropriate literature
- select and organize the relevant information for the presentation
- compose a presentation on the topic at the appropriate level for the audience
- use the appropriate presentation techniques and tools
- criticize and defend the topic in a scientific discussion

Literatur:

Literature

Primary literature will be provided by the supervisors of the individual topics.

Verwendbarkeit des Moduls / Einpassung in den Musterstudienplan:

Das Modul ist im Kontext der folgenden Studienfächer/Vertiefungsrichtungen verwendbar:

[1] **Physik mit integriertem Doktorandenkolleg (Master of Science)**
(Po-Vers. 2018w | NatFak | Elitestudiengang Physik mit integriertem Doktorandenkolleg (Master of Science) | Gesamtkonto | Physics seminar(s) | Laser matter interaction)

Dieses Modul ist daneben auch in den Studienfächern "Materials Physics (Master of Science)", "Physics (Master of Science)", "Physik (Master of Science)" verwendbar.

Studien-/Prüfungsleistungen:

Laser matter interaction (Prüfungsnummer: 71981)
Prüfungsleistung, mündliche Prüfung, Dauer (in Minuten): 45
Anteil an der Berechnung der Modulnote: 100% Prüfungssprache: Deutsch oder Englisch

Erstablegung: WS 2020/2021, 1. Wdh.: WS 2020/2021 (nur für Wiederholer)
1. Prüfer: Peter Hommelhoff

Organisatorisches:

Anmeldung per Stud-On. Bitte geben Sie Ihre drei Wunschthemen bei der Anmeldung an.