Updated version – note times!

KSETA Topical Courses, April 04 – 15, 2016

The Philosophy of Physics (better)	**Norman Sieroka (ETH Zürich)**	**04.04.2016** **05.04.2016** **bldg. 30.23, room 6/1 (video transmission to CN, bldg. 401, room 410)**	**14:00 - 17:00 h** **9:00 - 12:00 h**

The course provides a systematic introduction to philosophical questions in and about physics and to their historical development. After introducing important stages in the history of physics, starting with antiquity and the early modern period, the course focuses on the last two centuries. We will explore the development of electromagnetism, relativity theory, and quantum physics, and will examine the character of the knowledge that these theories provide. Particular attention is paid to typical explanatory strategies, to the role of experiments and predictions, to the formation and development of theories and concepts (such as causation), and to the significance and prominence of mathematics in modern physics.
The course is intended for graduate students who desire to learn more about the philosophical (especially epistemological) implications of physics theories they have studied or heard about. The references to the history of physics are born of a conviction that a deeper understanding of systematic questions can only be gained through an awareness of the origin and background of these questions.
The content of the course is based on the following two books:
- Norman Sieroka. Philosophie der Physik – Eine Einführung. Beck-Verlag, München 2014.
- James T. Cushing. Philosophical Concepts in Physics. Cambridge University Press, 1998.

Slavnov-Taylor-Identities and SUSY breaking in Dimensional Reduction (deeper)	**Dominik Stoeckinger (TU Dresden)**	**07.04.2016** **08.04.2016** **bldg. 10.50, room 702**	**13:30 - 16:45 h** **9:00 - 12:00 h**

Slavnov-Taylor-Identities and SUSY breaking in Dimensional Reduction

Third day moved to 15. April 2016, 14 – 17 h

Particle Physics for Engineers (broader)	**Marc Weber (KIT)**	**11.04.2016** **12.04.2016** ~~**13.04.2016**~~ **bldg. 10.50, room 702**	**9:00 - 12:00 h** **9:00 - 12:00 h** ~~**9:00 - 12:00 h**~~

This block course is targeting graduate students in electrical engineering, mechanical engineering and computer science. Requirements are some previous exposure to basics physics and mathematics. The course aims to clarify basics concepts and facts of particle physics and concludes with an overview of experimental techniques and current lines of research. Due to the limited duration the contents will be presented in a compact way with focus on intuition and analogies rather than formal correctness or mathematical rigor.

Data Visualization and Presenting (broader)	**Simon Niemes (KIT)**	**11.04.2016** **12.04.2016** **bldg. 10.50, room 702**	**13:30 - 16:45 h** **13:30 - 16:45 h**

Presenting Data in a meaningful and effective way is of great importance for every scientist. But even outside the scientific world, creating accessible infographs to convey a message is an important asset for a successful career. This course will give guidelines of how to create effective scientific plots. A good plot does not only delivers a message or visualizes the importance of data, a good plot is also easy to understand, respects barrier free access, and includes no 'chart junk'.
The course will cover the following areas:
• Advantages and disadvantages of different plot styles and when to use them.
• Effective graphic design.
• Formal rules of creating infographs.
• Differences in diagrams for written or oral presentations.
At the end of the course, participants should have a better understanding of how to produce meaningful figures and how to select the correct diagram type, depending on the message.

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Introduction to computer aided design (CAD) (broader)	**Thomas Huber (KIT)**	**13.04.2016** **14.04.2016** **bldg. 10.50, room 702**	**13:30 - 16:45 h** **9:00 - 12:00 h**

This "hands on" course is targeting PhD students who are doing their thesis in the field of experimental physics. Often a lot of time and effort is misspent by trying to construct by oneself essential mechanical parts of the experiment with a wrong approach. Still it is actually more economical to construct simple parts (that are ready to produce) with a CADsoftware, instead of giving a badly hand-drawn sketch to the engineering office. The course provides you with an understanding of the parametric design philosophy through a hands-on, practice-intensive lesson plan. The following will be included: An overview of mechanical design, how to work together in an efficient way with the engineers and tell you the needs of them to getting things done. Participants will learn the basics of computer aided design (CAD), creating a useful workpiece as 3D CAD model and what to with this CAD file to get it either produced in a workshop or printed with a 3D-printer. As CAD Software "Autodesk Inventor" will be used since it is de facto standard in industry. So it does not harm to get in touch with it. Autodesk offers a free (easy to get) 3 year license for (PhD) students. The system requirements should fit to every laptop. One week before beginning of the course the participants will receive an email with further information.

Introduction to neutrino physics (broader)	**Michael Wurm (Univ. Mainz)**	**14.04.2016** **15.04.2016** **bldg. 10.50, room 702**	**13:30 - 16:45 h** **9:00 - 12:00 h**

Since the 1930s when Pauli postulated the neutrino, a long series of experiments has steadily increased our knowledge on the properties of these ghost-like particles. This series of lectures aims to review the past, present and likely future experimental milestones along this path: Starting from the discovery of the free neutrino at the Savannah River reactor, we will proceed to the early experiments that established basic properties of the neutrinos, e.g. neutrino left-handedness in the Goldhaber experiment and the existence of different neutrino flavors at AGS and LEP accelerators. From there, we will turn to the first experiments searching for neutrinos from the Sun, the resulting solar neutrino deficit, and the eventual discovery of neutrino flavor oscillations by Super-Kamiokande, SNO and KAMLAND. Following the subsequent experiments using accelerators (MINOS, T2K) and reactor neutrinos (Double-Chooz, Daya Bay, RENO) that measured the neutrino mixing angles and mass squared differences, we will arrive at present-day experimental approaches for determining the neutrino mass hierarchy (DUNE, PINGU/ORCA, JUNO), leptonic CP violation and additional sterile neutrino flavors (SOX, STEREO). From here, we will turn to experiments measuring the neutrino mass in low-endpoint nuclear beta-decays (MAINZ, KATRIN, PROJECT-8) or electron captures (ECHO), and contrast these with neutrino-less double-beta decay searches (GERDA, EXO, KamLAND-ZEN) that have the potential to determine not only the neutrino mass but also its origin in a Dirac or Majorana mechanism. Time permitting, we will also review the possibility to investigate astrophysical sources by observing their neutrino emission over a wide energy range, from MeV-energy neutrino observations of solar and geoneutrinos in BOREXINO to the first evidence of PeV cosmic neutrinos in ICECUBE.

Courses / seminars at a later date:

How to write maintainable software (broader)	**Manuel Zamora (ETECTURE)**	**separate date, will be announced later, room tba**

Writing software is hard, maintaining it and keeping it from becoming a big entangled mess is even harder. In this course we will discuss patterns, tools and techniques to help you to architect, modularize, document and test your code to build system which can scale with its requirements and team size. Many of the presented concepts are language independent, but when applicable examples will be given in multiple languages to demonstrate their versatility.

Higgs physics beyond the Standard Model (deeper)	**Carlos Wagner (Univ. Chicago, USA)**	**separate date, will be announced later, room tba**

The Higgs particle dicovered in 2012 can well be an element of an extended Higgs sector, which comprises additional Higgs particles. The course may cover specific extensions of the Standard Model with this feature such as the (Next-to-)Minimal Super-symmetric Standard Model and phenomenological aspect such as collider signatures of an extended Higgs sector.

Cryogenics (broader)	**S. Grohmann (KIT)**	**Lecture during SS16**	**See university calendar**

Properties of Helium: classical fluid; quantum fluid; Cooling methods: $T \geq 4.2$ K; $T < 1$ K; Engineering aspects: safety of cryogenics; systems and project management

JAVA (broader)	**course will be offered by MINT kolleg**	**SS16**	**http://www.mint-kolleg.kit.edu/Info.php**

www.kseta.kit.edu