Registration until September 15, 2020

KSETA Topical Courses, Sept 28 – Oct 9, 2020

All courses will take place via zoom

Feynman Diagrams in Condensed Matter Theory (broader) **Theoreticians and experimentalists**	**Markus Garst (TFP)**	**28.9.20** **29.9.20**	**9:00 - 10:30 + 13:30 - 15:00** **9:00 - 10:30 + 13:30 - 15:00**	**zoom**

The low-energy properties of condensed matter are often captured by effective field theories, that correctly describe the behavior of observables, e.g., in the limit of low temperatures or close to phase transitions. For the computation of perturbative corrections as well as the renormalization group flow around such theories Feynman diagrams need to be evaluated. We provide some illustrative examples for the application of the Feynman diagram technique in condensed matter and discuss corresponding experimental signatures.

Projectmanagement (better) **all**	**Udo Erdmann (TIBER)**	**30.9.20** **01.10.20** **09.10.20**	**13:30 - 16:45** **9:00 - 10:30** **9:00 - 10:30**	**zoom**

As a graduating scientist or engineer, you are planning a next career step within industry. If this is the case, you definitely have to cope with management responsibilities. Therefore, skills in management and leadership will be expected. Planning to open an own business or start up requires knowledge in managing a company as well. In both cases the needed skills can be divided in three classes: corporate management, project management, technology and innovation management. Based on practical, handy examples the three aforementioned classes will be introduced (approximately 2 hours per class). After this one day introduction you will have a good overview of what will be expected of you outside of science. Additionally to that you will be empowered to make a better decision for the next career step based on your existing skills. You will be supplied with a better picture of the industrial and business world, and you will get hints which of your skills should be more sharpened and which skills should be developed from scratch. Additionally to that, fundamental questions concerning the application for an industrial job will be clarified: „How do I apply the right way?, and „How will I increase my chances in the interview?“, are just a few of them.

Scientific writing (better) **All (max 12 participants)**	**C. Fitzsimons**	**05.10.20** **06.10.20**	**9:00 – 17:00** **9:00 – 17:00**	**zoom**

Researchers increasingly need to publish their work in English in order to reach a wider audience and improve their academic standing. Sometimes their level of English leads reviewers to reject the papers or to misunderstand the contents. The seminar comprises two one-day interactive sessions that take participants step-by-step through the writing and revision of one of their papers at the conceptual, organisational and writing levels. First, participants learn how to ensure
that the paper's content fits to their message and audience. Then, they learn how to organize a paper and structure a logical argument in English. Finally, participants learn how to revise their texts at the section, paragraph and sentence level. At each level we explore the main differences between papers in English and German.
Between sessions, participants apply the theory to their own texts. They also receive feedback and suggestions for improvement of their texts from the workshop leader. By the end of the course each participant will have polished one paper and will be able to approach the next one confidently.

Neutrino physics (broader) **Theoreticians, exp., engineers**	**Th. Schwetz-Mangold**	**07.10.20** **08.10.20**	**9:00 - 10:30 + 13:30 - 15:00** **9:00 - 10:30 + 13:30 - 15:00**	**zoom**

This course will give an overview from basics to current research in neutrino physics for experimentalists and theoreticians. We discuss neutrino oscillations and neutrino mass determinations and review our current understanding of three flavour neutrino mass and mixing parameters. We discuss the argument, why finite neutrino mass implies physics beyond the Standard Model and how neutrinos may provide a portal to new physics. The covered topics include also sterile neutrinos, implications of neutrinos in cosmology, and Leptogenesis, which may link neutrinos to the creation of matter shortly after the Big Bang.

Interpretations of quantum mechanics (broader) **Theoreticians and experimentalists**	**Roderich Tumulka**	**01.10.20** **02.10.20**	**10:45 - 12:15 + 15:15 - 16:45** **9:00 - 10:30 + 13:30 - 15:00**	**zoom**

The mathematical formalism of Quantum Mechanics has proven to be successful in predicting the outcome of experiments targeted at small scales. In contrast, the physical interpretation of the abstract mathematics is not settled at all. While the Kopenhagen interpretation is nowadays the one accepted by most physicists, there are many others that lead to the same experimental conclusions. In this course, we will review some of these interpretations, like the many worlds interpretation or Bohmian mechanics.

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System-on-Chip (ASIC) (deeper) **exp., engineers**	**I. Peric (IPE)**	**WS 20/21**	**Monday afternoon – see lecture catalog**	**zoom**

In the lab course System-on-Chip, a mixed-signal hardware architecture for audio playback is developed as system-on-chip (SoC). In contrast to, for example, microprocessors, SoCs are integrated circuits combining different elements on one chip: Those elements can be programmable logic and processors or analogue circuits. Development of SoCs is driven by reduction of costs, energy consumption and miniaturisation.
In the course, analogue and digital hardware is designed for building an audio amplifier starting from building the schematic, over simulation, to layout of the circuit for production of an application-specific integrated circuit (ASIC).

KSETA Topical Courses, Oct 28 + 29, 2020

This course will take place via zoom

Introduction to Machine Learning and Deep Learning (broader) **Theoreticians, exp., engineers**	**Simon Kast (Bosch)**	**28.10.20** **29.10.20**	**9:00 - 10:30 + 13:30 - 15:00** **10:45 - 12:15 + 15:15 - 16:45**	**zoom**

In this course, we will introduce the fundamental principles and concepts of the Machine Learning approach on the example of decision trees. First we will start with the principles of decision tree methods and have a discuss such things as training and validation, hyper-parameter tuning, bias-variance trade-off, model-complexity, regularization, ensemble methods, etc. In the second part we will have some coding exercise on this subjects. In the last part we will also introduce the basic ideas of neural networks and deep learning models. We will discuss the motivation for those models, their effectiveness for solving complicated tasks, the trainings process and have a look at some special architectures.