



KSETA Topical Courses, October 05 – 16, 2015

All courses take place at KIT Campus South building 30.28 (new building near physics high-rise)

1 Introduction into the concepts of theoretical particle physics for experimental physicists (broader)	Monika Blanke	13.10.15, room 005 14.10.15, room 004	13:30 - 17:00 13:30 - 17:00
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This course provides an introduction to theoretical particle physics tailored for people with an experimental background. It includes a (relatively non-mathematical) introduction to quantum field theory and discusses the guiding principles for model building in particle physics. It will focus in particular on the importance of symmetries and the relation between Lagrangians, Feynman diagrams and cross sections. Furthermore, the course provides an overview of the Standard Model of particle physics (SM) and the most popular models beyond the SM (e.g. Supersymmetry and composite Higgs models).

2 Particle physics for engineers and others (broader)	Marc Weber	12.10.15 13.10.15 16.10.15 19.10.15 each day room 004	9:00 - 12:00 9:00 - 12:00 15:30 - 17:00 10:30 - 12:00
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This block course of 9 hours duration 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 basic 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 and somewhat superficial way with focus on intuition and analogies rather than formal correctness or mathematical rigor.

3 Modern silicon detectors (deeper)	Ivan Peric	05.10.15, room 004	9:00 - 17:00
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Silicon detectors - signal and noise
 Silicon detectors for photon science
 Silicon detectors for particle physics
 CMOS Sensors

4 Effective Field Theory (deeper)	Thomas Becher (Uni. Bern)	12.10.15 13.10.15 each day room 004	13:30 - 17:00 13:30 - 17:00
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Effective Field Theories are an important tool in quantum field theory. They allow one to separate physics at disparate energy scales, expand in small scale ratios and resum logarithmically enhanced contributions to all orders. Traditionally, effective field theories are obtained by integrating out the heavy particles in a given theory and their degrees of freedom are the light particles. Modern effective theories (such as HQET, NRQCD, SCET) describe more complicated situations, in which the fields do not directly correspond to particles, but to different low-energy momentum regions which are relevant in a given process. In these lectures, we will first cover the basic concepts of effective field theory. Then, after discussing the momentum regions arising in low-energy expansions of Feynman diagrams, we turn to modern effective field theories and their applications. The course assumes basic knowledge of quantum field theory and perturbation theory.

5 Time and Self-management in Science (better)	Sita Schanne (Uni Heidelberg)	06.10.15 07.10.15 each day 004	9:30 - 17:30 9:30 - 17:30
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- Time-management techniques (long-term and short-term): How do I set up a project plan? How do I distribute my tasks over the week and avoid time pressure?
- Work-Life-Balance: Which goals and activities in the various areas of life are important to me?
- Motivation and resources: How do I bring myself to goal-oriented action? How do I realize my plans in practice? Where do I get support from?
- Communication: How do I communicate my plans effectively? How can I ask for feedback from supervisors and peers?

Goal: Participants have gained an overview on basic aspects of time and self management. By reflecting on their own experience they have been introduced to different time management techniques.



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6 How to write a world class paper – workshop on International publishing (better)	Henri van Dorssen, Elsevier, UK Dagmar Gebauer, Elsevier, D	08.10.15, room 004	9:00 - 17:00
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Introduction and publishing circle
 How to get Published with practical demonstration how to find a suitable journal (Elsevier Journal Finder Tool, Scopus Journal Comparison Tool)
 How to Review a Manuscript // Reviewer Recognition Programs
 The Impact Factor and other Bibliometric Indicators; Altmetrics
 Author Rights and Open Access
 Research and Publication Ethics
 How to get your paper noticed with practical demonstration Mendeley & ScienceDirect
 MyResearchDashboard and Publishing Campus
 Q&A Session “All you ever wanted to ask regarding scientific publishing”

7 Multivariate data analysis: New techniques and developments in the recent years (broader)	Stefan Ohm (DESY Zeuthen)	15.10.15 16.10.15	13:30 - 17:00 9:00 - 12:00
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each day room 004

We live in a world where the amount of data in all areas of life is exploding. Multivariate analysis techniques are indispensable tools when trying to analyze and interpret this information. Physicists and Astronomers, for instance, are often faced with the situation where they have to crawl large data sets to search for small signals in a large background.

In this course I'll give a short introduction to the field of data science, (a glimpse into) the statistics behind it and the topic of machine learning. The most common machine learning algorithms like neural networks, boosted decision trees or k-Nearest Neighbors are discussed in more detail.

In the second, hands-on, part of the course we will have a look at real examples: How to get data samples, how to parameterize and prepare them for analysis, and finally how to extract information with multivariate analysis techniques.

- Laptop with python installed and the following packages: pandas, scikit-learn, numpy, astropy, scipy, argparse, pip, ipython or:

- laptop with VirtualBox installed (an Ubuntu installation and all necessary tools will be provided)

- More details will come on the webpage: <http://stefanohtm.com>

8 Parton Shower Monte Carlo (broader)	Stefan Gieseke	14.10.15 15.10.15	9:00 - 12:00 9:00 - 12:00
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each day room 004

The course on Parton Shower Monte Carlos will cover technical details and the underlying physics of Monte Carlo Event generators for hadron colliders as they are commonly used at the LHC. The course will start with some technical introduction to Monte Carlo integration and then we go through and discuss the event generation as it goes.

Beginning with a short discussion of hard interactions we will discuss parton showers in-depth and give a short overview of hadronisation models and hadronic decays. Modern techniques to match or merge parton showers with higher order matrix elements will be discussed in detail. The tour is rounded off with a discussion of the so-called underlying event.

9 What do I need, if I will leave science towards industry? (better)	Udo Erdmann (TIBER)	09.10.15, room 004	9:00 - 17:00
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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.