KSETA Topical Courses, September 12 – 23, 2016

All courses in the same room: KIT Campus South, **building 30.22, seminar room 229.4**

Particle propagation in astroparticle physics (broader)	Günter Sigl (Univ. Hamburg)	**12.09.2016**	**9:00 - 16:45 h**

Proper understanding of how astroparticles propagate through the universe helps us better understand what to expect at Earth. Models for various scenarios also aid us in our interpretation of what we measure. We'd like a theoretical overview of the different propagation scenarios/models for astroparticles in magnetic fields as well as a summary of existing programs in which they are implemented. A brief demonstration on these programs' use would also be welcome.

Scientific programming with Mathematica (broader)	Thomas Hahn (MPI Munich)	**15.09.2016** **16.09.2016**	**13:30 - 16:45 h** **9:00 - 12:15 h**

I will give an introduction to scientific programming in high-energy physics, with both symbolic and numeric methods. The focus will be not so much on how to use existing packages, but rather to show with concrete examples how to solve typical problems in high-energy physics. For example, a color trace is computed using different methods. Languages used are Mathematica, FORM, C, Fortran, and a little bit of shell scripting. The lectures are self-contained, e.g. familiarity with Mathematica is not assumed; the selection of topics/examples is somewhat theory-biased, however.

Collaborative software design (better)	Manuel Giffels Martin Heck	**15.09.2016** **22.09.2016**	**9:00 - 12:15 h** **13:30 - 16:45 h**

Version Control is a standard method for software development in teams but has much broader useful applications. We will introduce collaborative software design and cover topics from the basics (no previous knowledge required) down to deep details like testing, release management, etc.

Introduction to Cosmology (broader)	Silvia Mollerach (UNSAM)	**19.09.2016** **20.09.2016**	**9:00 - 12:15 h** **9:00 - 12:15 h**

The course presents an introduction to the standard Big Bang model.
The main topics to be covered are:
Fundamental observations of the structure of the universe at large scales.
Description of the universe evolution: Friedmann equations.
Thermal history of the Universe: nucleosynthesis and the origin of Cosmic Microwave Background (CMB) radiation.
Observational evidence for dark matter and dark energy: CMB anisotropies, accelerated expansion, gravitational lensing.
Basics of inflation and status of recent observations.

Particle physics for astroparticle physicists (broader) mainly for astroparticle physicists	R. Wolf, M. Mozer, K. Rabbertz	**19.09.2016** **20.09.2016** **21.09.2016**	**13:30 - 16:45 h** **13:30 - 16:45 h** **13:30 - 16:45 h**

Accelerator based particle physics today is focusing on very few big machines. The flagship accelerator is of course the LHC covering a very broad range of topics. In the near future, a dedicated high-luminosity B-factory will start up. The course will start with basics on accelerator and detector technology as well as analysis techniques and then cover an overview of recent scientific achievements and remaining open questions in particle physics.

Introduction to string theory (broader) Mainly for theoreticians	Timo Weigand (Uni Heidelberg)	**21.09.2016** **22.09.2016**	**9:00 - 12:15 h** **9:00 - 12:15 h**

String theory replaces the notion of pointlike fundamental objects in nature by one-dimensional fundamental strings. Combined with the usual axioms of quantization and general covariance, this results in a perturbative interacting quantum theory free of ultra-violet divergences. Its low-energy limit includes massless spin-one and spin-two states, thereby unifying gauge and gravitational interactions in a consistent framework. Compactification of this necessarily higher-dimensional theory makes contact with modern concepts of geometry and provides links to particles physics, quantum field theory, quantum gravity, and mathematics.
The first part of these lectures will introduce the basic concepts of perturbative string theory, starting from the quantization of the classical string worldsheet action, including configurations with D-branes, and deriving the Hilbert space of states.
In the second part we will discuss aspects of the low-energy effective action and introduce some notions of compactification,

www.kseta.kit.edu

time permitting with applications to particle physics.

Astroparticle physics: 13 billion years of evolution reviewed in a one-day-course (broader) Mainly for exp. + theo. particle physicists	G. Drexlin, K. Eitel, D. Veberic	23.09.2016	9:00 - 16:45 h

Astroparticle physics is the field at the intersection of particle physics, astronomy and cosmology. It combines our knowledge about the largest structures in the Universe with our understanding of the smallest particles and the forces between them. The research programme at KIT addresses fundamental questions in this context: Where is the origin of cosmic rays, and how do these charged particles propagate in the Milky Way? What are the highest-energy particles and how do they obtain their incredibly high energies? Why do we need Dark Matter? Can we detect Dark Matter particles directly or indirectly via their annihilation products? What is the mass of neutrinos and how did they shape the structure of the early Universe? In this introductory course we will explain how to tackle these questions, how they are linked and how they are addressed by experiments.

November 2016
The course will take place at KIT Campus South, **building 30.95, seminar room A + B**

Memorizing, reading and working strategies (better)	Erika Magyarosi	07.11.2016 08.11.2016	9:00 - 17:00 h 9:00 - 17:00 h

In the first part of the seminar, you get to know different memorizing strategies that help you to remember numerous kinds of information quickly and reliably – names and dates, the content of a speech or presentation, as well as complex contents, whose acquirement extend over several months. Besides getting to know the methods, we will especially focus upon the adjustment of your own thinking model and structures. In this way, you will have the possibility to develop your own memorizing strategies during numerous practical exercises, which allow you to apply the mnemonic-techniques in your professional and private everyday life.

The second part of the seminar deals with reading and working strategies, which enable a quicker and more efficient reading and working speed. We will do some exercises for rapid and disciplined eye movements. You will get to know verified learning and reading strategies and we will deal with themes such as reading motivation and reading assistance. Furthermore, we will learn how to improve concentration, to expand your vocabulary and to read more efficiently at your computer.