Registration open until February 22, 2021

KSETA Topical Courses, March 1 – 12, 2021

All courses will take place via zoom

Scientific presentation (better) **all**	**E. Magyarosi**	**02.03.2021** **05.03.2021**	**9:00 - 16:45** **9:00 - 16:45**	**zoom**

This is an activity-based workshop with plenty of opportunities for you to practice, discuss, give and receive feedback. It is imperative that you attend the full session. The Scientific Presentation workshop aims to provide you with the necessary skills to successfully and dynamically present the relevance of your work and the core message of your talk. It imparts necessary skills to successfully and appealingly present scientific papers at conferences, and to be able to confidently defend research results during discussions. It also addresses non-verbal communications such as appropriate and fluid body language; the ability to listen and react generously; and to integrate focusing techniques which magnify the power of the speaker.

Organic Semi-conductors (broader)	**W. Wenzel (INT) ,** **A. Colsmann (LTI)**	**04.03.2021**	**9:00 - 12:15**	**zoom**

Organic semiconductors are widely used in prominent applications such as organic light-emitting diode displays and organic solar cells. The state of the art of predictive simulation methods is discussed, including machine learning, to complement experimental research in the identification of novel materials in the vast available chemical space, and their potential is illustrated with a few prominent recent applications.

Introduction to astroparticle physics (broader)	**D. Kang (IAP)** **D. Veberic (IAP)**	**08.03.2021** **09.03.2021**	**13:30 - 16:45** **13:30 - 16:45**	**zoom**

Astroparticle Physics is a broad field where particle physics is merged with astrophysics and cosmology. It studies elementary particles in view of their astronomical origin and their relations to astrophysical objects. It involves also searches for new fundamental physics and tries to explain and better understand our Universe and its observed phenomena. This lecture series will provide four selected topics in astroparticle physics: cosmic rays, gamma rays, high-energy neutrinos, and dark matter. We give an overview of their detection methods, trends, and established results, and discuss current understanding and remaining open questions as well. A multi-messenger approach in high energy astrophysics will be also briefly discussed.

Statistical methods in particle physics data analysis (broader)	**A. Meyer (DESY)**	**03.03.2021** **10.03.2021**	**9:00 - 12:15** **9:00 - 12:15**	**zoom**

Probability distributions and their statistical properties play a fundamental role in the data analysis of particle physics experiments and elsewhere. The lecture covers current statistical methods in particle physics and their foundations, as well as some of the recent developments. In the first part of the four lectures, inference methods for parameter estimation, hypothesis testing and determination of confidence intervals are introduced. In the second part, we will address multivariate analysis, classification and machine learning methods. As time permits, unfolding techniques and systematic uncertainties will also be discussed.

High Performance Computing at KIT (broader)	**J. Buchmüller, M. Götz, S. Braun (SCC)**	**11.03.2021**	**9:00 - 16:45**	**zoom**

This course will give an overview of the possibilities in high performance computing at SCC and how to use it. A major part will deal with the introduction to Juypter a modern way of programming and use of supercomputers. After the presentation of the HPC infrastructure, the use of Jupyter will be addressed. It will be shown how the required resources can be selected with the help of JupyterHub and which possibilities JupyterLab offers for programming and data analysis on the HPC facilities. We will also explore scientific numerical array computing using the Python-based programming library PyTorch. It does not only allow traditional computation on CPU, but also processing acceleration via GPUs. In an exemplary use case, the course participants will gain hands-on experience.

Observational Cosmology (broader)	**H. Hildebrandt (Uni Bochum)**	**12.03.2021**	**9:00 - 16:45**	**zoom**

Over the past few decades, the investigation and description of the Universe as a whole has transitioned from theoretical speculation to a strongly data-driven empirical field of modern physics. In this lecture course, the theoretical basis for homogeneous world models, the thermal history of the Universe, and large-scale structure formation will be reviewed. Next the most important observational probes, such as supernovae of type Ia, the cosmic microwave background, galaxy redshift surveys, galaxy cluster counts, and gravitational lensing observations, will be discussed. Results from these probes led to the establishment of the so-called standard model of cosmology. The theoretical and observational status of this standard model with its main components of dark matter and dark energy will be presented. Recent developments that might be hints for shortcomings of the - up to now incredibly successful - standard model will be discussed. The lecture course will conclude with an outlook to future projects that will have the potential to revolutionise our understanding of the Universe as a whole.