THE CHINESE UNIVERSITY OF HONG KONG
Earth System Science Programme

Announcement for Students
2020-21

Term 2

ESSC2010 Solid Earth Dynamics
Have you ever wondered why and where earthquakes and volcanos happen? Do you want to learn how to tell the differences between fool's and real gold in a rock? Are you interested in a geological adventure in Hong Kong's GeoPark or a journey to the centre of the Earth (using earthquake waves)? You will get all these knowledge and experience in ESSC2010 Solid Earth Dynamics. This introductory course offers comprehensive and insightful surveys on fundamental phenomena, processes, and principles of the solid earth system under the scientific framework of plate tectonics.

ESSC3100 Structural Geology is an intermediate level ESSC course. It trains students to recognize different lithological units and their geometries in three dimensions (3D); and understand the related tectonic environment and formation mechanism. Class lectures introduce geological structural features in 3D manner, basic skills of map reading and interpretation. Field projects are real case studies of local field observation, description, field data acquisition, analysis, sample collection and geological map compilation.

ESSC3220 Atmospheric Chemistry is a study of the composition of the atmosphere, the sources and fates of gases and aerosols (or particulate matter, PM) in air, and changes induced by natural and anthropogenic processes. It has received great attention since many environmental issues such as ozone hole, greenhouse gases, and air pollution involve gases and aerosols. Atmospheric chemistry not only focuses on the photochemistry of the constituents of air, but also studies the formation of aerosols, dispersion of gases and aerosols, and biogeochemical cycles. It is a multidisciplinary study that helps students to better understand our environment through broad thinking.

ESSC3600 Ecosystems and Climate
Most of us are aware of how different life forms adapt to the environment and climate they live in. This course, however, focuses on the opposite question: do living organisms actively modify the world around them? Here you will learn the various interesting ways through which different life forms (mostly plants and microbes, a little bit on insects and marine animals) interact and shape their environment and climate, both physically and chemically. Simple mathematical and computer models, as well as numerical and computational exercises using the R programming language, will be used to illustrate the emerging interrelationships between life and climate. We will also ask important questions such as how we should better manage ecosystem resources to better mitigate climate change and pollution. This course will not only be crucial for students in the atmospheric and climate sciences, but also highly relevant for students in the biological and physical sciences who are interested in the basics of ecohydrology, biogeochemistry and ecosystem ecology, and who want to acquire basic computational skills for analyzing climate and ecosystems.

ESSC3601 Principles of Ecosystems and Climate
This course is the same as ESSC3600 but with one fewer credit unit (i.e., two credit units only), and without the numerical and computational exercises using the R

programming language. This course, therefore, focuses more on the theories and scientific aspects, but omits the technical aspects.

ESSC4010 Solid and Fluid Mechanics
The contents of this course overlap with ESSC3010 Continuum Mechanics that had been offered in previous years. Accordingly students who have already taken ESSC3010 are excluded from enrollment in ESSC4010.

ESSC4510 Statistical Data Analysis
This course covers the theoretical basis and practical applications of statistical analysis relevant for earth system science. Based on the use of Python (a statistical computing language), this course aims to introduce students to Earth and environmental data manipulation, from sampling, reading and writing, to statistical analysis and parameter estimation, to plotting and visualization. Topics include: sampling techniques; probability distributions; hypothesis testing; correlation analysis; linear and nonlinear regression; time series analysis; multivariate statistical analysis; and geostatistics. Tutorials will be based on real geophysical examples including remote sensing and in situ observations, as well as model data

EASC5101 Advanced topics in Geophysics
This course covers earthquake source physics, including quantitative seismology, rock friction, and numerical methods. Although this is coded as a graduate level course, it is open to ESSC undergraduate students who have taken either Continuum Mechanics or Seismology. Undergraduate students can register the course with help from ESSC general office.

EASC 5602 Selected Topics in Earth and Atmospheric Sciences
For this term, the topic will be “Volcanoes: Formation, Unrest, and Eruption”. On any given day, ~20 subaerial volcanoes worldwide are erupting. Even more submarine volcanoes are probably erupting without being detected. Volcanic eruptions can have devastating economic and social consequences, but are also the fundamental force that builds the majority of our planet’s surface. Volcanic eruptions and emissions can also affect atmospheric and climate conditions. Many volcanic eruptions have precursory signals and there have been cases of successful evacuation issued, though many have also erupted without any forewarning. This course will explore the various techniques used to study volcanoes’ underlying structure as well as their precursory and eruptive activity. Volcano science is fundamentally a multi-disciplinary field so the course will try to embody this spirit. Graduate and undergraduate students from both geophysics and atmospheric science streams are welcomed to take the course.

If you have any questions about any of ESSC courses, feel absolutely free to contact Prof. Amos Tai (amostai@cuhk.edu.hk).