

AS110: Remote Sensing of the Ionosphere using Very Low Frequency Radio Waves (2 weeks)

(A certificate course for UG and PG students)

Instructors: T. Basak, S. Palit, D. Bhowmick,

TA: S. Chakraborty, T. Bera

Mode of Instruction: English

Syllabus

Introduction to VLF-Ionospheric Science and Signal Observation (Week 1)

Instructor: T. Basak, S. Palit, D. Bhowmick

Overview: This week focuses on building foundational knowledge of the ionosphere and Very Low Frequency (VLF) science, with hands-on training in VLF signal monitoring and data acquisition techniques.

Orientation Session: Introduction to the internship program, Overview of VLF monitoring facilities at IERCOO Campus, ICSP, Discussion on the research prospects in ionospheric science; **Fundamentals of the**

Ionosphere: Structure and properties of atmospheric and ionospheric layers, Solar-ionosphere interactions and their effects on VLF propagation; **VLF Observational Techniques:** Introduction to VLF receivers and antenna systems, Instrumentation and methods for data acquisition, Hands-on experience with signal amplitude and phase monitoring; **Observation Strategy:** Identification of VLF signatures related to solar flares, outer-galactic events, stratospheric and seismic activity, Techniques for event classification and correlation, **Data Analysis Basics:** Introduction to software tools used in VLF science, Basics of data visualization using GNUPLOT and XMGRACE, Preliminary data processing and plotting techniques

VLF Data Analysis and Report Writing (Week 2)

Instructor: T. Basak, S. Palit, D. Bhowmick

Overview: In the second week, students will execute assigned projects involving real VLF data. They will analyze signals, interpret results, and prepare comprehensive reports under expert guidance; **Project Work:** Execution of individual or group projects with mentor supervision, Data analysis and interpretation of VLF signal datasets, Identification of ionospheric disturbances and parameter variations; **Software Training:** Guided sessions on data processing using Python, MATLAB, and other relevant tools, Estimation of ionospheric parameters from VLF datasets; **Presentation and Reporting:** Preparation and submission of a project report detailing methods, analysis, and conclusions, Project presentations followed by feedback and discussion sessions, Final review and certification upon successful completion of the program