

MHRD Scheme on Global Initiative on Academic Network (GIAN)
Magnetohydrodynamics in the Light of Astrophysical Dynamos' Analytic, Asymptotic and Numeric Applications
Course Dates: 19-29 September 2022 (Online)

Overview

Nowadays magnetohydrodynamics are subjected in the wide range of scientific and technology applications starting from metal casting, nuclear power stations, many others and finishing with astrophysical dynamos where the greatest achievements in analytic, asymptotic and numeric approaches are reached recently. Those impressive approaches will be presented in the proposed course in the way that they could be effectively used in many other scientific and industrial applications. In this course, current/previous analytic, asymptotic and numerical methods are intended to be presented together with the results of their application to the simulation of planetary, Solar, stellar and galactic magnetic activities. We will present various analytic, asymptotic and numeric solutions explaining in detail their methodical and practical usefulness for participants in the computational sciences, basic sciences, Civil engineering, Chemical engineering, Physics, Applied Mathematics, Climate, Marine, Ship crafting, Air crafting, programming and many others.

Objectives

This course provides training in the application of the modern astrophysical dynamos' based mathematics to a wide range of problems in various science and technology. Emphasis will be placed on the formulation of problems, on the analytical, asymptotical and numerical techniques for a solution, the computation and presentation of results. The primary objectives of the course are as follows:

- i) Elucidate the fundamentals of the dynamos' analytic, asymptotic and numeric applications.
- ii) Introduce the computational methods necessary for the dynamos' numeric modeling.
- iii) Derive the magnetohydrodynamics' induction and dynamo equations.
- iv) Generalize magnetohydrodynamics' analytic, asymptotic and numeric approaches for using in the other scientific and industrial applications.
- v) Application of methods mentioned above in modeling of the planetary, Solar, stellar and galactic magnetic activities.

Modules	Module A: General magnetohydrodynamics and dynamo effects : Introduction to MHD (Magneto-Hydro-Dynamics) and induction equation, Magnetic Reynolds number and MHD theorems, Multipole expansions, Kinematic MHD dynamos, Differential rotation and alpha effects, free decay. Module B: Astrophysical MHD dynamo modeling: MEGA Method, Complete dynamo system, MHD scaling laws, Problems' survey.
You Should Attend If you are...	<ul style="list-style-type: none"> ▪ Executives, engineers and researchers from private/government organizations including R&D laboratories. ▪ Student students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.
Selection and Fees	<p>Candidates registering early will be given preference in short listing process. Selected participants will be intimated through email.</p> <ul style="list-style-type: none"> • Faculty (Internal & External) and Scientists from R&D Labs: Rs.2000/-. • Persons working in Industry/ Consultancy firms: RS.4000/- • Students & Research Scholars <ul style="list-style-type: none"> • Without award of Grade: Rs.1000/- • With award of Grade: Rs.1500/- • Students from abroad: \$50 • Faculty/Scientists/Industry Persons from abroad: \$100
REGISTRATION PROCESS:	<ul style="list-style-type: none"> • Visit http://www.gian.iitkgp.ac.in/GREGN/index and create login User ID and Password. Fill up the registration form and do registration by paying Rs.500/- online through Net Banking/Debit/Credit card. • Login to the GiAN portal with the user ID and Password already created. Click on Course Registration option at the top of Registration form. Select the course titled "Magnetohydrodynamics in the Light of Astrophysical Dynamos' Analytic, Asymptotic and Numeric Applications" from the list, click on Save option and click on Confirm Course.

The Faculty



Prof. Sergey V. Starchenko working on problems related to magnetism and hydrodynamics in the Earth, planets, stars, galaxies and other objects since 1985. His main specialization is analytic and asymptotic modeling of convection and magnetism in fast rotating shells. At present he is Head of Main Geomagnetic Field laboratory of IZMIRAN and Chief Investigator under the State Project "Nature, observation and modeling of the magnetic field, evolution and electrical conductivity of the deep interior of the Earth and the planets". Besides he is the Head of the subprogram "Solar and other planetary systems" of the program of fundamental research of the Presidium of the Russian Academy of Sciences "Cosmos: studies of fundamental processes and their interrelations". His main achievements in scientific management were the leaderships of two INTAS grants (~\$300k each) in 1999-2002 and 2004-2007. He was head of seven Russian Foundation for Basic Research's 3-years' grants (~\$60k each) and principal investigator in other six. He headed two Russian Academy Programs (2011-2013, 2018-2020) and one Russian President (2006-2007) grant (~\$40k each). He works in many scientific journals and funds as expert and referee.



Dr. HP Rani, Faculty of Mathematics from NIT Warangal obtained her doctorate degree from Anna University, Chennai and has vast experience as an academician and researcher by working in prestigious National Taiwan University, Taiwan and Kyung Hee University, South Korea. She has introduced a concept of boundary layer flow visualisation through heatlines and masslines. Her work in flow assisted corrosion problems has gained currency in the nuclear industry. The detailed analysis of microcirculatory blood flow in hepatic lobule has got much appreciation from the medical community. Her area of interest includes Computational Fluid Dynamics, Heat and Mass Transfer, Corrosion, Biomechanics, magnetohydrodynamics and Geodynamo problems.

Course Co-ordinator

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