

OVERVIEW OF THE COURSE

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.

COURSE CONTENTS

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.

FACULTY: Prof. Sergey V. Starchenko



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, (HOD) Faculty of Mathematics from NIT Warangal obtained her doctorate degree from Anna University, Chennai and has vast experience as an academican 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.

MHRD Scheme on Global Initiative on Academic Network (GIAN)



10 Days GiAN Course

on

Magnetohydrodynamics in the Light of Astrophysical Dynamos' Analytic, Asymptotic and Numeric Applications

19-29 September 2022 (Online)

6.30 – 9.30PM (IST)

International Faculty

Prof. Sergey V. Starchenko

Head of Main Geomagnetic Field laboratory of IZMIRAN

Coordinator

Dr. H.P. Rani

Organized

by

DEPARTMENT OF MATHEMATICS

NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

TELANGANA STATE – INDIA

ABOUT GIAN

MHRD, Govt. of India has launched an innovative program titled “Global Initiative of Academic Networks (GIAN)” in Higher Education, in order to garner the best international expertise into our system. As a part of this, internationally renowned Academicians and Scientists are invited to augment the country’s academic resources, accelerate the pace of quality reforms and elevate India’s scientific and technological capacity to global excellence.

WHO CAN PARTICIPATE?

- Executives, Engineers and researchers from private/Government organizations including R & D laboratories.
- Students at all levels (B.Tech/ M.Sc/ M.Tech/ Ph.D) or faculty from reputed academic institutions and technical institutions.

REGISTRATION PROCESS:

Stage-1: Web Portal Registration

Visit <http://www.gian.iitkgp.ac.in/GREGN/index> and create login User ID and Password. Fill up the registration form and do web registration by paying Rs. 500/- online through Net Banking/Debit/Credit card. This provides the user with life time registration to enroll in any number of GIAN courses offered. (If you have already registered in GiAN portal you can skip this step.)

Stage-2: Course Registration:

Login to the GiAN portal with the user ID and Password already created in Step 1. 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 and click on Save option. **Confirm your registration by clicking on Confirm Course.**

REGISTRATION FEE:

Faculty (Internal & External) and Scientists from R&D Labs	Rs. 2,000/-
Persons working in Industry/ Consultancy firms	Rs. 4,000/-
Students & Research Scholars <ul style="list-style-type: none">• Without award of Grade• With award of Grade	Rs. 1,000/- Rs. 1,500/-
Students from abroad	\$ 50
Faculty/Scientists/Industry Persons from abroad	\$100

SELECTION AND MODE OF PAYMENT:

Last Date to Apply: 15th August 2022

Candidates registering early will be given preference in short listing process.

Selected candidates will be intimated through E-Mail. They have to remit the necessary course fee to the Bank as per the details given below.

Account Name	GIAN NITW
Account No	62447453600
Bank	State Bank of India
Branch	REC Warangal (NIT Campus)
Branch Code	20149
IFSC Code	SBIN0020149
MICR Code	506004011
SWIFT Code	SBHYINBB018

For **any queries** regarding registration of the course, please contact the **Course Coordinator:**

Dr. H.P. Rani,
Department of Mathematics,
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About the Institute and Warangal:

National Institute of Technology, Warangal (NITW) formerly known as RECW is the first among seventeen RECs set up in 1959. Over the years, the Institute has established itself as a premier Institution in imparting technical education of a very high standard, leading to B.Tech, M.Tech, Integrated M.Sc. and Ph.D. programmes in various specializations of Science and Engineering streams.

Warangal is known for its rich historical and cultural heritage. It is situated at a distance of 140 km from Hyderabad. Warangal is well connected by rail and road. National Institute of Technology, Warangal campus is 3 km away from Kazipet railway station and 12 km away from Warangal railway station. Hyderabad is the nearest Airport from Warangal. NIT Warangal is 2½ hrs drive by cab on Hyderabad - Warangal National Highway number-202.

ABOUT DEPARTMENT

The Department of Mathematics was *established in 1959* and has always shared the vision of the institute in striving for excellence in teaching and research activities. Over the years, the department has evolved as one that provides excellent teaching and research in Applied Mathematical Sciences. The frontier areas of research of the department include: Fluid Mechanics, Bio-mechanics, Mathematical Modeling, Numerical Analysis, Finite Element Method, CFD, Optimization Techniques, Coding Theory, etc. Our Department is recognized by AICTE as the only QIP centre for PhD programmes among all NITs. The department started its M.Sc. Applied Mathematics course in the year 1970. In the context of changing needs of the software industry, the Department is also offering a Computer Oriented Mathematics course – M.Sc. (Mathematics and Scientific Computing). The department offers 5 year Integrated M.Sc Mathematics course, which is started in the year 2021. The department has signed MoU with Indian Institute of Geomagnetism.