

## OVERVIEW OF THE COURSE

The generic interdisciplinary approach of scientific computing is generally considered to be a main pillar of science and technology, complementary to experiment and theory. To carry out such interdisciplinary approach there is an urgent demand of researchers who are well-trained in scientific computing methods. It is the particular ambition of the emerging research communities to promote the use of computational methods in yet largely unexplored areas such as targeted medicine, cancer therapy, electromagnetics, magnetohydrodynamics, ferrohydrodynamics, naval architecture, aerodynamics, electro-magnetic wave propagation in optical waveguide etc. To meet this demand, the course, computational Methods and parallel processing in science and technology, emphasis the state-of-art in contemporary mathematical methods for the problems related to the fluid dynamics with a wide spectrum of industrial applications.

The increasingly important role of numerical methods in science and engineering will be addressed. While treating traditional and well-developed topics, the emphasis will be placed on the concepts and ideas of importance to the design of accurate and efficient algorithms with the applications to scientific computing. The course combines the deep understanding of the computational methods and algorithms in Applied Mathematics, the implementation of these methods using modern computer science technology and the application to real-world problems.

Topics will include the simulations of complex physical, biological, and engineering systems, optimization and evaluation of simulation models, scientific visualization and parallel computing on GPU (Graphics Processing Unit). The comparison between the CPU programming and the hardware-oriented GPU programming executed in machines with much larger number of processing cores will be dealt. Implementation of modern GPUs in different parallel applications will be taught to reduce a large amount of computing time. Mathematical techniques including finite-difference, finite-volume, finite-element and particle methods with their accuracy, convergence, and stability of numerical methods; turbulence modeling;

Parallel computing and multiphysics modeling will be the major contents of this course.

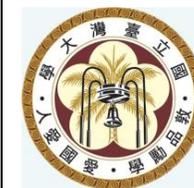
At the end of the course the participants will be able to pursue innovative research work with a strong application-oriented focus anywhere from mathematics, physics and engineering sciences.

## COURSE CONTENTS

- i) Fundamentals of scientific computing methods, viz, finite difference, finite element, finite volume and particle methods.
- ii) Application of the above methods in solving the Navier-Stokes and Maxwell equations.
- iii) Parallel computing on GPU
- iv) Specific application of above mentioned methods in the biomedical science, electromagnetic and defence applications.

## FACULTY: PROF. TONY W.H. SHEU

**Prof. Tony W.H. Sheu**, from Department of Mathematics, National Taiwan University, Taiwan, is the recipient of the Taiwan-France Science & Technology Award for his work in computational biology. Prof. Sheu has published more than 300 articles related to code development using contemporary computational techniques and its applications in science and technology, ranging from interaction between electrons and atoms to electromagnetic waves. He is an editorial member of Journal of Computational Surgery, Mathematical Problems in Engineering, American Journal of Heat and Mass Transfer, etc. Researchers across the globe worked with him as a post doc, research associates, master and bachelor degrees. He is one among the researchers in Taiwan who won NSC (National Science Council) special researcher award. Prof. Sheu acted as the deputy director, Centre of Advanced Study in theoretical Science (CASTS), National Taiwan University. He is also contributing his research studies as a Professor, Institute of Applied Mathematical Science, National Taiwan University. Prof. Sheu holds a position of deputy director, Taiwan Society of Industrial Applied Mathematics (TWSIAM), also Centre for Quantum Sciences and Engineering (CQSE) and is an executive committee member of Centre of Advanced Study in Theoretical Sciences (CASTS), National Taiwan University. He is an advisory member of National Centre for High-Performance Computing (NCHC).



## 10 Days GiAN Course

on

## Computational Methods and Parallel Processing in Science and Technology

December 20-30, 2017

*International Faculty*

**Professor Tony W. H. Sheu**

*Department of Engineering Science & Ocean Engineering*

*Institute of Applied Mathematical Sciences (adjunct)*

*Department of Mathematics (adjunct)*

**National Taiwan University, Taipei, Taiwan**

*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?

If you are a undergraduate/postgraduate student or researcher or faculty or scientist from technical and academic institutions or from industry interested in learning or do research in solving multidisciplinary problems related to modern medicine, electromagnetics, defence and engineering flows.

## 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 "**Computational Methods and Parallel Processing in Science and Technology**" from the list and click on Save option. **Confirm your registration by clicking on Confirm Course.**

For **any queries** regarding registration of the course, please contact the Course Coordinator:  
Dr. H.P. Rani  
Department of Mathematics,  
NIT, Warangal – 506004, Telangana  
Tel: +91 870 246 2834 (O); +91 9908143247  
Email: [hprani@nitw.ac.in](mailto:hprani@nitw.ac.in); [cmppst2017@gmail.com](mailto:cmppst2017@gmail.com)

## REGISTRATION FEE:

Faculty	Rs. 4,000/-
Participants from Industry / Research Organizations	Rs. 8,000/-
Students & Research Scholars <ul style="list-style-type: none"><li>• Without award of Grade</li><li>• With award of Grade</li></ul>	Rs. 1,000/- Rs. 2,000/-
Students from abroad	\$ 100
Other Participants from abroad	\$ 200

The above fee includes all instructional materials, computer use for tutorials and assignments, free internet facility, with mid-sessions tea, snacks and working lunch.

Participants from academic/research institutes and Industry will be provided boarding and lodging on additional payment of Rs.4,400/- in Visitors Block on sharing basis. Students & Research Scholars will be provided with boarding and lodging in Institute Hostels on additional payment of Rs.2,200/-. Travelling allowance will not be provided.

## SELECTION AND MODE OF PAYMENT:

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.

Outstation participants requiring boarding and lodging facilities have to pay appropriate fee in addition to the course fee.

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

## 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 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). Recently the department has signed MoU with Indian Institute of Geomagnetism.

