

About GIAN Course:

About GIAN Course: Ministry of Human Resource Development (MHRD), Government of India (GoI) has launched an innovative program titled “Global Initiative of Academic Networks (GIAN)” in higher Education, in order to garner the best international experience. As 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.

About NIT Warangal

National Institute of Technology Warangal, formerly known as Regional Engineering College was established in 1959. Over the years it has developed into a premier institute of higher learning and is ranked among the top technical education institutions in India. There are 14 Departments offering eight undergraduate and 31 post-graduate programmes besides doctoral programmes. About 5000 students across the country and about 500 international students’ study in the campus. It is a fully residential campus sprawling over 250 acres with excellent infrastructure.

About Warangal

Warangal is the second largest city of the state of Telangana. It is situated at a distance of 140 km from the state capital Hyderabad (Nearest Airport). It is well connected by Rail (Kazipet Junction is 2 km away and Warangal Station is 12 km away) and by Road (NH 202). Warangal is renowned for its rich historical and cultural heritage. It was the seat of erstwhile 5th Kakatiya dynasty. It is a place of tourist attraction with a number of historical monuments like Thousand Pillars Temple, Warangal Fort, Bhadrakali Temple, Ramappa Temple and Laknavaram Lake.



Brief Profile of the Civil Engg. Department

The Department of Civil Engineering offers B.Tech in Civil Engineering, Seven M.Tech programs including Engineering Structures and a PhD program. The Department is a recognized QIP Centre since 1978. It has well established and well-equipped state of the art laboratories with experienced faculty engaged in teaching, research, capacity building activities and industry extension services. Faculty members represent several policy making and professional bodies. The Department has liaison with reputed industries and R&D organizations.

For any queries regarding the course, please contact

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**A One Week GIAN Course
On**

**Experimental Modal
Analysis: Applications in Civil and
Mechanical Engineering Systems.**

**Jan 31st - Feb 4th, 2022
(Online)**

Call for Registration and Participation

International Faculty

Dr. P. Raju Mantena, Fellow ASME

Professor

Department of Mechanical Engineering

Carrier 201B, University of Mississippi

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University, MS 38677

Coordinators

Dr. D Ravi Prasad

Dr. T.P. Tezeswi

Organized by

Structures Division

Department of Civil Engineering

National Institute of Technology

WARANGAL – 506 004

Telangana State, INDIA

Overview of the GIAN Course:

Dynamic response of structures continues to present a major concern for a very wide range of engineering problems. Dynamic tests represent an inexpensive way to obtain critical information on the mechanical behavior of a structure. Thus experimental modal testing has become indispensable in the field of structural assessment, not only with regards to Mechanical Engineering systems, but also in Civil Engineering.

Modal testing enables to determine the dynamic properties of a structure quickly without difficulties. Moreover, it provides useful information with regard to design, optimization, structural health monitoring, vibration control and damage detection in structures. With the advent of vibration measurement systems and analysis methods, Experimental Modal Analysis (EMA) has gained popularity all over the world.

In an effort to solve noise and vibration problems in today's advanced machines, vehicles and civil engineering structures, experimental modal analysis provides a means for modelling, and if required, modifying the complicated dynamic behaviour of structures. Modern digital systems provide the opportunity to incorporate measurement, analysis and data display into a format which enables engineers to design better structures.

This course is intended to provide a thorough coverage of theoretical concepts as well as laboratory experimental techniques of modal analysis, including instruments required, test setup, data measurement and digital signal processing concepts, modal parameter estimation techniques, application of frequency response function and modal models suitable for practical vibration analysis problems.

2.0 Objectives

The primary objectives of the course are:

- ❖ To introduce participants to the fundamentals of experimental modal analysis.
- ❖ To give insight into practical tests and instruments, as well as techniques needed for the measurement of modal parameters.
- ❖ To enhance the capability of the participants in identifying and applying vibration techniques to health monitoring of Civil and Mechanical engineering systems.

Who can participate?

This interdisciplinary program on **Experimental Modal Analysis** will be beneficial to faculty members /research scholars/ students /scientists and technologists of Mechanical and Civil Engineering. The following persons can attend this program:

- ✚ Faculty from academic Institutions
- ✚ Scientists/Technologists from research organisations.
- ✚ Practicing engineers from Govt./private organisations
- ✚ Research scholars and Master's students from academic institutions.

(Number of participants for the course will be limited to fifty only)

Registration Fee:

- ❖ Faculty & Scientist from Research Organizations: Rs. 2,000/-
- ❖ Participants from Industry /Consultancy Firms: Rs. 4,000/-
- ❖ PG & Ph.D Students : Rs. 1,000/-
- ❖ Faculty/Scientist/Industry Participants: \$ 100/-
- ❖ Students from Abroad: \$ 50/-

(The Registration fee includes course material, access to video recorded lectures)

Selection and Mode of Payment:

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 (EMA)
Account No & Bank	62447453600, SBI
Branch	SBI, NIT Warangal, 20149
IFSC Code	SBIN0020149
MICR Code	506002030,
SWIFT Code	SBININBBH14

Candidates who registered early will be given preference in short listing process.

How to Register?

Step-1: One-time Web (Portal) Registration:

- Visit **GIAN** Website at the link:
<http://www.gian.iitkgp.ac.in/GREGN/index>
- Create login User ID and Password.
- Fill up the blank registration form and do web registration by paying Rs 500/- online through Net Banking / Debit / Credit card.
- This provides him/her with life time registration to enrol in any number of the GIAN courses offered in future.

Step-2: Course Registration (Through GIAN Portal):

- ✚ Log in to the GIAN portal with the user ID and Password created.
- ✚ Click on **"Course Registration"** option given at the top of the registration form.
- ✚ Select the Course titled **" Experimental Modal Analysis: Applications in Civil and Mechanical Engineering Systems"** from the list and click on **'Save'** option.
- ✚ Confirm your registration by Clicking on **'Confirm Course'**.

Step-3:

- The registered participants on GIAN portal will be informed by the Program Coordinator through E-mail regarding their shortlisting/selection for the program.
- The shortlisted candidates are then required to pay the applicable Registration fee, as mentioned above.

International Faculty: Prof. P. Raju Mantena



Prof. P. Raju Mantena, Ph.D., Fellow ASME is a Professor at Department of Mechanical Engineering, University of Mississippi, USA. He received his M.S. and Ph.D in Mechanical Engineering, from University of Idaho, Moscow, USA. Dr. Raju Mantena is an authority on Experimental Modal Analysis, additional research interests in optimizing the blast, shock, ballistic, and impact response of composite structures, nano-reinforced materials, structural foams, and non-destructive evaluation of composite structures and nano-engineered materials. He has served as PI/Co-PI for over ten million dollars of research grants from the NSF, NASA, USDA, ONR, ARO, DHS, DURIP, EPRI, AOC, Allied Signal and Dow Automotive. Dr. Mantena is an award-winning faculty who has taught Engineering Mechanics, Mechanics of Composite Materials, Experimental Modal Analysis, and Experimental Stress Analysis.

Host faculty: Dr. D. Ravi Prasad



Dr. D. Ravi Prasad is an Assistant Professor in the Department of Civil Engineering at NITW having 18 years of teaching experience. He works in the area of Structural health monitoring, sustainable construction materials, hybrid fiber reinforced engineered cementitious composites and functionally materials guided 23 post-graduation students so far and Guided 03 Ph.D scholars and at present 04 research scholars are working under him besides B.Tech project guidance. Dr. Ravi Prasad has published 50 research articles in various reputed international journals (SCI/Scopus), international and national conferences. He is a Reviewer for reputed International journals.

Host faculty: Dr. T. P. Tezeswi



Dr. T. P. Tezeswi is an Assistant Professor in the Department of Civil Engineering at NITW. His areas of expertise include structural dynamics, nonlinear finite element analysis, composite materials, vibration testing, photo elastic testing, high strain rate micro-mechanics and non-destructive evaluation.

Dr. Tadepalli has served as PI for several prestigious DRDO and IMPRINT sponsored research projects. He previously worked as a Senior Engineer at Hinman Consulting Engineers, San Francisco, CA, USA and as the Project Engineer for NEESit, UCSD. He holds a US Patent. He has several publications & serves as reviewer in reputed international journals.

Course details

The program is planned for 5 days consists of 12 hrs lectures and 10 hrs Laboratory demonstration/Tutorials

Day 1

- **Introduction** to Structural dynamics/Mechanical vibrations
- Frequency Response Function (FRF) Data for SDOF and MDOF Systems.
- Problem solving – SDOF & MDOF systems

Day 2

- **Introduction to experimental and analytical modal analysis**, Philosophy of Modal Testing, applications, advantages and limitations. Frequency Response Function and Transfer Function Relationship.
- **Laboratory demonstration** to measure Frequency Response function measurements using Impact hammer test.
- Test setup, instruments for measurement of modal parameters.
- Modal analyses of Structural and automotive systems by using up-to-date instrumentations.

Day 3

- **Modal analysis:** Shaker test. Test setup, measurement of modal parameters. FRF estimation, comparison of hammer test and shaker test.
- **Modal Parameter Estimation:** Preliminary Checks of FRF Data, Curve Fitting Methods SDOF and MDOF Methods. Single/Multiple Reference Concept of Real and Complex Modes
- Laboratory experiments on test specimens using shaker test.

Day 4

- **Structural Measurements:** Power Spectra, FRF (H1, H2, Hv), Single/Multiple Input for FRF and power spectra, Coherence function (Ordinary/Multiple)
- **Improving Measurement Accuracy:** Transduction, Measurement Interpretation, Measurement Averaging, Windowing Time Data, Increasing Measurement Resolution, Complete Survey
- **Modal Analysis Software Overview:** Geometry creation, Data Acquisition, Graphics Displays and Modal parameters estimation.
- **Conduct of Exam** for the award of grade

Day 5

- **Applications of modal analysis** in health monitoring of civil and mechanical engineering systems.

