

Self-sponsored One Week Online Faculty Development Program (FDP)/ Short Term Course on “FEM and Modal Analysis in Engineering”

(FEMMAE-21)

24th –28th December, 2021

Department of Mechanical Engineering

Dr. B. R. Ambedkar National Institute of Technology

Jalandhar-144011 Punjab

Objectives of the STC

Exposing the participants to need of computational approach and scope of FEM solutions. Fundamental implementation concepts in FEM, weighted residual methods/ weak form formulations, application in engineering problems. Explore non-linear FEM, solution methodology by non - linear FEM and case study of practical engineering problems that arise in different domain namely structural analysis, fluid flow, heat transfer, vibrations, etc.

Finite Element Method (FEM) is the most powerful method for the analysis of engineering problems. It is capable of handling geometry complicated domains, a variety of boundary conditions, non-linearity and coupled phenomenon those are common in real life problems. The physical knowledge of method enhances the analysis skill and provides a greater understanding of the problems being solves. Commercial software packages based on the finite element method are often used in industrial, research and academic institutions for the solution of engineering and scientific problems related to solid mechanics, fluid mechanics, heat transfer, and structural dynamics. The intelligent use of these software packages and correct interpretation of the output is often predicted on knowledge of the basic concept of FEM.

Modal analysis is the study to predict and measure the dynamic characteristics of a structure. The spatial model, modal-model and a response model can be measured by using the experimental modal analysis technique. Finite element method is one of the important tools to predict the above models. Experimental modal analysis is carried out by using the transducers and the FFT analyzers. FEM and experimental modal analysis results are compared and the discrepancies between the results may be reduced by using the finite element model updating techniques. Nowadays the application of the finite element model updating technique is widely used in the aerospace industry, automobile industry, electronics etc.

This course will be particularly beneficial for engineering students, engineers and scientists working in various institutions. At the end of the course, participants may be in position to identify and select appropriate finite element methodologies for specific conditions.

About NIT Jalandhar

National Institute of Technology (NIT), Jalandhar (erstwhile REC Jalandhar), was established in the year 1987 and attained the status of National Institute of Technology on October 17, 2002 and the status “Institute of National Importance” by Act of Parliament in 2007. As NIT, the Institute has a responsibility of providing high quality technical education in Engineering and Technology to produce competent technical manpower for the country. The Institute offers B. Tech. programs in eleven disciplines Biotechnology, Chemical Engineering, Civil Engineering, Computer Science & Engineering, Electrical Engineering, Electronics & Communication Engineering, Industrial & Production Engineering, Instrumentation & Control Engineering, Information Technology, Mechanical Engineering, Textile Technology. The Institute also offers M Sc. programs in Physics, Chemistry and Mathematics; MBA in Humanity & Management; Fifteen M.Tech Programmes and PhD programmes in all disciplines. As per the survey conducted by NIRF, DQ-CMR best technical school survey and India Today-MDRA Best Colleges Ranking in the year 2020, the institute was ranked 49th, 18th and 22nd respectively, amongst all engineering institutions, including IITs in the country.

The Institute has signed Memorandum of Understanding (MoU) with many prestigious institutes such as University of Florence, Italy, Ecole Centrale de Lille, France, University of Johannesburg, South Africa, University of Bolton, UK, University of South Alabama, USA, etc. for the mutual academic exchange and strengthening of the academics and research.

Vision

To build a rich intellectual potential embedded with interdisciplinary knowledge, human values and professional ethics among the youth, aspirant of becoming scientists, engineers and technologists so that they contribute to society and create a niche for a successful career.

Mission

To become a leading and unique institution of higher learning, offering state-of-the-art education, research and training in engineering and technology to students who are able and eager to become change agents for the industrial and economic progress of the nation. To nurture and sustain an academic ambience conducive to the development and growth of committed professionals for sustainable development of the nation and to accomplish its integration into the global economy.

About the Department

Mechanical Engineering is amongst one of the early branch of engineering started in the institute. It came into existence in 1992. Quality teaching is what we aim at so as to stimulate intellectual curiosity, creativity and innovativeness. With a dedicated team consisting of highly qualified and experienced faculty members in all streams of Mechanical Engineering, the department aims at providing education and research of world class level. The department is enriched by 21 faculty members.

The autonomy of the Institute is a privilege to the department in terms of flexibility to modify and revise courses/syllabi at different time intervals to cater contemporary needs of the Industry. The Department has established state-of-the-art facilities in various laboratories. The present education program offers undergraduate and two post-graduate program in M.Tech in Design Engineering, and Thermal Engineering. At presently (61) sixty one research scholars are registered in the department for pursuing Ph.D. Adequate inputs of practical training, industrial tours, project work and computer applications are given to support core theory courses.

The 19th ISME Conference is organized by the department during in Dec. 20th-22nd 2018, 1st International Conference on Materials Science and Engineering (ICMSE-2019) during in June 11th-12th, 2019 at Dr B R Ambedkar National Institute of Technology, Jalandhar. The department has organized several faculty development programs cum short term courses including “FEM and Modal Analysis in Engineering related to engineering applications” in Dec. 24th -28th 2019.

Who can attend the Short Term Course?

This course on “FEM and Modal Analysis in Engineering” is open to the faculty members, students from Engineering Institutes/ Colleges/ Polytechnics and Practicing Engineers and Researchers from Industries and R&D institutions.

General Information

Participants are requested to keep Laptops for better learning experience during practice sessions on ABAQUS, ANSYS and MATLAB Software.

Organizing Committee

Chief Patron

Sh. Subhash Chandra Ralhan

Chairperson, BOG, Dr B R Ambedkar National Institute of Technology Jalandhar

Patron

Professor Prof R K Garg

Director, Dr. B. R. Ambedkar National Institute of Technology Jalandhar

Chairman

Dr. Pramod Kumar

HOD, Department of Mechanical Engineering, Dr. B. R. Ambedkar NIT Jalandhar

Course Coordinators

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Departmental Organizing Committee

Prof Joseph Anand Vaz

Dr Dwesh K Singh

Prof Subhash Chander

Dr Nitin Sharma

Mr Ajay Trehan

Dr Rajan Kumar

Dr Dinesh K Shukla

Dr Ranchan Chauhan

Dr R S Bharj

Dr Sanjay

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Dr Raman Bedi

Dr Satyender Singh

Dr S K Tiwari

Dr Saurabh Kango

Dr T Srinivas

Dr Sumit Sharma

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Course Coordinators

Dr. Manoj Kumar & Dr. Ashok Kumar



Department of Mechanical Engineering



Organized by

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**Dr. B. R. Ambedkar National Institute of Technology
Jalandhar-144011 Punjab**

www.nitj.ac.in

For registration

| | |
|-----------------------|-----------------------------|
| For NIT Jalandhar | Rs 700/- |
| Outside NIT Jalandhar | Rs 850/- Including GST @18% |

Link for the Online Registration and Payment:

https://www.nitj.ac.in/events_registration/femmac/login

Please register online or before **December 20th, 2021**. Applications will be considered on first- come, first served basis (date of receipt of registration). Preference will be given to faculty members, research scholars and people from industry. **Maximum number of participants allowed for this course will be 75**. You are requested to mail the registration slip with complete information to **Dr. Manoj Kumar and Dr. Ashok Kumar**.

Topics to be covered

- ⇒ Fundamental of FEM and FEM for solid mechanics problems.
- ⇒ FEM for solid mechanics problems (1D and 2D) and Non Linear solid mechanics problem Using ABAQUS/ ANSYS
- ⇒ FEM for Impact and contact Mechanics problems.
- ⇒ FEM for Composite Material and MICRO FEM of Composite and its application using ABAQUS/ANSYS.
- ⇒ Introduction to Non Linear FEM (Elasto-plasto non-linear FEM)
- ⇒ Fundamental of Modal Analysis and its applications
- ⇒ State Space Methods for Modal Analysis
- ⇒ Introduction to Modal Testing and Applications using FEM

Outcome the course

The course will also provide a thorough idea of the Finite Element Method (FEM) from the fundamental concepts to more advanced topics to the participants which will help them to write their own codes and implement these novel methods to solve numeric simulations. At the end of this course, the participants will be in a position to identify and select appropriate finite element methodologies for specific conditions. Also, the participants will be able to predict the natural frequencies and viscous damping coefficient of structures by plotting the frequency response function (FRF) curve. However, the information regarding the mode shapes of the structure will also guide the participants to locate the exact position of the transducers on the complex structures.