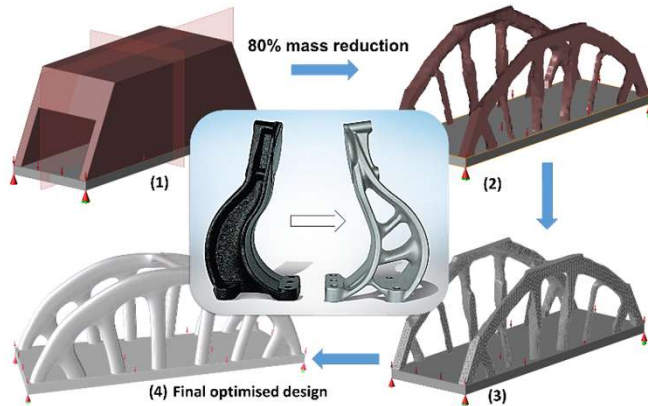


Short term course on
**Design and Topology
Optimization using Finite
Element Method**

21 - 23 December 2017



Coordinator

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Organized by

Department of Mechanical Engineering
Indian Institute of Technology (IIT) (BHU)
Varanasi-221005



COURSE OBJECTIVE

The cut-throat competition for light weight product with minimum cost puts designers and engineers under huge pressure to optimize their design at concept state itself. Topology optimization using Finite Element Method (FEM) optimizes material layout within a given design space, for a given set of loads, boundary conditions and manufacturing constraints with the goal of maximizing the performance of the system. Once the component design is frozen, any further modifications becomes a costly affair. This course aims at providing the much needed FEM skills to analyse the components at concept stage for light weight and efficient components. Furthermore, with the advent of new technology such as 3D Printers (Additive Manufacturing), wherein any complex shape can be printed easily, topology optimization becomes even more imperative. At the end of this course, participants will be able to optimize any components with ease.

COURSE CONTENT

DAY 1

FEM theory: Design for Governing differential equations, Finite element discretization techniques, Weighted residual methods: Subdomain, Galerkin, Petrov-Galerkin, Least square, Collocation methods; Weak form, Rayleigh Ritz method.

Computer Aided Designs (CAD): Drafting, learning various methods to design components, 2D and 3D geometry generation techniques.

Loads and Constraints: How to apply various boundary conditions such as pressure, forces, contacts, friction surfaces, thermal, concentrated mass, gravity loads etc,

various types of supports such as fixed, pin and roller joints, fasteners and joints, techniques for applying loads and constraints on hole centre etc.

Connections: Techniques for modeling fasteners: nuts and bolts, crews etc., joints, generating various types contacts such as bonding, sliding etc.

DAY 2

Static Analysis: Modeling and comparing FEM results with theories for problems like critical stress, von Mises stress, calculating stress concentration factor, deflection of beams etc., designing within factor of safety, thermal stresses, running animation etc., comparing FEM results with theory.

Dynamic Analysis: Design based on vibration analysis, how to extract midsurfaces from solids, surface modeling, extracting structures natural frequencies (normal modes), fix and free modal analysis, analysis under buckling loads, extracting buckling modes etc.

DAY 3

Topology Optimization: theoretical background, Shape Controls: How to apply manufacturing constraints such as draw directions and symmetry, how to apply draw directions (single, split and extrusion), how to apply stamping as additional manufacturing constraints etc.

Minimization Objective: Maximize stiffness or minimize mass; Optimization with various constraints such as frequency, stress, gravity, thickness and minimum factor or safety constraint.

Free-Form Solid Geometry: Fit new free-form solid geometry on the optimized design, polyNURBS; exporting geometry for further editing and analysis

Examples from various fields such as automotive, aerospace, civil engineering etc. will be considered in modelling

WHO CAN ATTEND

- Students/faculty/engineers from Civil, Mechanical, Structural, Automotive, Electrical, Construction, Aerospace, Biomedical etc can attend.
- This course is not just a course, it is a skill building program. Anyone interested to enhance their skill in the CAE domain, are welcome to participate.

CERTIFICATE

A certificate of completion of the course would be issued to all the participants.

LOCATION

Varanasi Railway Station is well connected to almost all parts of the India. Also it is well connected via Air to Delhi, Mumbai, Kolkata, Hyderabad, and Bengaluru. There are frequent flight services from New Delhi. The Institute is located in the south of the Varanasi city and about 7 km away from Varanasi Railway Station and 30 km from the Babatpur (Varanasi) airport. Taxis, Auto-rickshaws, are available as transport.

IMPORTANT DATES

Early bird registration: before 1st November 2017.

Last date of registration: 10th December 2017

Enquires should be addressed to:

Dr. Om Prakash Singh, Associate Professor,
Department of Mechanical Engineering, IIT (BHU),
Varanasi – 221 005

E-mail : stccdfem@gmail.com,
opsingh.mec@iitbhu.ac.in ,

ACCOMMODATION

Shared accommodation in the IIT guest house will be provided on payment basis. Participants interested to stay outside the campus in hotels can make their own arrangement.

REGISTRATION FEE

Before 1st November

- IIT BHU student: Rs. 2000/-
- Non-IIT BHU student : Rs. 4,000/-
- Faculty member : Rs, 6,000/-
- Industry professional: Rs. 8,000/-

After 1st November

- IIT BHU student: Rs. 3000/-
- Non-IIT BHU student : Rs. 6,000/-
- Faculty member : Rs, 8,000/-
- Industry professional: Rs. 12,000/-

REGISTRATION PROCESS

- Send an email to stccdfem@gmail.com and CC to opsingh.mec@iitbhu.ac.in with the subject line STC18. Mention the list of participants interested to attend the course.
- Depending upon the seat availability, a provisional confirmations though email will be sent within 2 hour.
- After receiving email confirmation, kindly pay ONLINE within a week **OR** speed post the registration fee (Cheque/DD in favour of **STC CFD FEM** payable at Varanasi, U.P) to the address given below
- Mention your name, designation (student, faculty or industry professional) address, mobile number and email id on the back of the DD/Check. The same information should also be sent as email. In case of many participants with a single DD/Cheque, use a separate sheet of paper to mention participants details. **There is no separate registration form.**
- If registration fee is paid via online transfer, the participant should inform the transaction details/proof of money transfer via email. Kindly mention participant's name in the remark section during the bank transaction.

Address

Write "FEM: Topology Optimization" on the top of the envelope and send Cheque/DD to the following address:

Dr. Om Prakash Singh, Department of Mechanical Engineering, IIT (BHU), Varanasi, U.P, India-221005

ONLINE REGISTRATION FEE PAYMENT

Account holder name: **STC CFD FEM**

Bank name: **State Bank of India**

Branch: **IT-BHU**, Branch code: **11445**

Account No.: **36911862248**

Account type: **Current**

IFS Code: **SBIN0011445**

EVALUATION AND GRADING

There is will be continuous evaluation of each participants during the course on the understanding of the concepts and skills.

- A overnight assignment will be given to the participants whose evaluation will be done next day morning.

COMMITTEES

Patron:

Honorable Professor Rajeev Sangal, Director, IIT (BHU)

Organizing/Advisory committee, IIT (BHU)

Dr. Om Prakash Singh

Prof. Prashant Shukla

Prof. Pradyumna Ghosh

Dr. Swati Sunder Mondal

Dr. Jahar Sarkar

Dr. Amitesh Kumar

Dr. Arnab Sarkar