

Center-of-Excellence In Visualizing Engineering

In quest for providing better Technical and Professional Education to our students through all the affiliated colleges, we at VTU, Belagavi have established the Centre-of-Excellence in Visualizing Engineering.

To Support our Mission :

- To empower the Industries with the required Skills and Multipronged approach for the overall development of the Industries and New Workforce.
- To Help Students to understand the theoretical concepts better by letting them visualize thescenarios using Advance Simulation Tools
- To Train the students using the modern simulation tools & make them industry ready by Providing opportunity to undertake real life and Industry Oriented Projects



Program Objectives

The specific objectives of this initiative are as follows

- Bridge the gap between Academic knowledge imparted and Industry skills expected
- Help students understand the engineering concepts better by visualizing the results
- Encourage students to perform industry-sponsored projects to gain insights on real life problems and how to solve them
- Disseminate the knowledge, methodologies, and tools developed by the extensive Industry experience of Execution Partner through CoE for Visualizing Engineering through direct development of focused course curriculum, training and practical exposure, enhancing the quality of faculties
- Enable students to use modern simulation tools that are used in the industry

- Provide an interface with the Industry for them to identify students with specific skills needed by them
- To develop interdisciplinary Skills and Industry-focused, mission driven training and serve as a role model of university-Industry-government collaborative partnership

CoE Objectives

The CoE will be aimed at developing the students with:

- A recognition of the need for, and an ability to engage in life-long learning
- An ability to use the techniques, skills, and modern engineering tools necessary for industry practices
- Ability to engage in Knowledge acquisition and Transfer, spurring innovation
- Ability to acquire multi-disciplinary competencies and talent dispersion
- An ability to design a system, component, or process to meet ever demanding performance and Safety Standards within realistic constraints such as economic, environmental, manufacturability, and sustainability
- An ability to identify, formulate, and solve engineering problems seamlessly functioning on multi-disciplinary teams with skill to manage uncertainty in line with Industry's practical demands making them readily employable
- An ability to analyze a problem, and identify, articulate, and use the appropriate computing and engineering requirements for obtaining its solution **(Engineering Problem Solving Skills)**
- Increase Industry's engagement with the Advanced Manufacturing CoE to ensure training outcomes are of high quality and relevant to the needs of employers to improve skills utilization and workforce development

CoE Outcomes

- Introduce Industry-oriented practical courses in the identified technical institutes that help visualize concepts from various engineering subject from basic to advanced
- Train the Trainer programs to train the faculty in batches
- e-Learning courses for 24 x 365 access
- Provide training to the faculty at identified common centers on these courses
- Creating employable graduate engineers with exposure to real life problems

Altem Technologies Pvt. Ltd., in Association with Hexagon MSC Software, has come up with Visualizing Engineering initiative, which supports our mission in improving the learning as well as developing industry ready skills. The VTU - Visualizing Engineering Initiative is aimed in developing vital skill of Spatial Visualizing and making students try out the workshop examples of the topics they learn in theory virtually using advanced industry standard simulation tools for better understanding the concepts.

Hexagon MSC Software and Altem Technologies Pvt. Ltd., has thoughtfully worked in collaboration with Our eminent Faculties and Industrial Advisory board, with an objective to contribute towards **“Enhancing the Quality of Engineers Graduating Out of all the Engineering Colleges affiliated with VTU”**.

Under **Visualizing Engineering®** initiative We have jointly mapped the syllabus **covering all mechanical engineering topics from 3rd Semester to 8th Semester of Mechanical Engineering and allied branches**. This includes deep coverage of Metals, Alloys and Composites, Forging, Rolling, Welding, Metal Cutting and the New Manufacturing Techniques like Powder Metallurgy and Additive Manufacturing, Strength of Mechanics, Fracture, Fatigue, Hardening and Grain Formation, Kinetics and Dynamics of Machines and Mechanisms, Robotics, Fluid Dynamics, Rotor Dynamics, Vapour Cycles and Renewable Energy etc.

Out of the 37 Subjects (Approximately for Mechanical Engineering Syllabus excluding subjects like Mathematics, Operation Research, Humanities, Management etc.) from Semester III to Semester VIII, for Mechanical Engineering & related branch, **28 subjects can be addressed** using Visualizing Engineering Initiative. With a large breadth of MSC’s solutions suite, **Visualizing Engineering will address up to approximately 80% of the topics** in each of these subjects.

Visualization leading to improved comprehension

Software Solution

Open the results file "Problem2-N.FEM" in Textpad/Notepad (any text editor)
Displacement at Node 22 is 0.39062 mm (refer Figure 3)

Node	Displacement (mm)
22	0.39062

Displacement values match with the hand calculation.

Both Answers are same 0.39062 mm

Individual Assignments:

1. Change Modulus of Elasticity
2. Different Material to Different students
3. Diameter and Length increase of 10 from Roll No 1.....

Group Assignments:

1. Analysis as per group of materials, group of students and Modulus of Elasticity

Solved Worksheet

Worksheet 2: From Strength of Materials, 4th Edition, by S S Bhavikanti
The stepped bar shown in Figure below, is made up of two different materials. The Material 1 has Young's modulus = $2 \times 10^5 \text{ N/mm}^2$, while that of Material 2 is $1 \times 10^5 \text{ N/mm}^2$. Find the extension of the bar under a pull of 25 kN if both the portions are 20 mm in thickness.

Analytical Solution

$$A_1 = \frac{\pi \times 40^2}{4} = 1256.64 \text{ mm}^2$$

$$A_2 = \frac{\pi \times 30^2}{4} = 706.86 \text{ mm}^2$$

Extension of portion 1 $\frac{PL_1}{A_1 E_1} = \frac{25 \times 10^3 \times 500}{1256.64 \times 2 \times 10^5} = 0.0981 \text{ mm}$

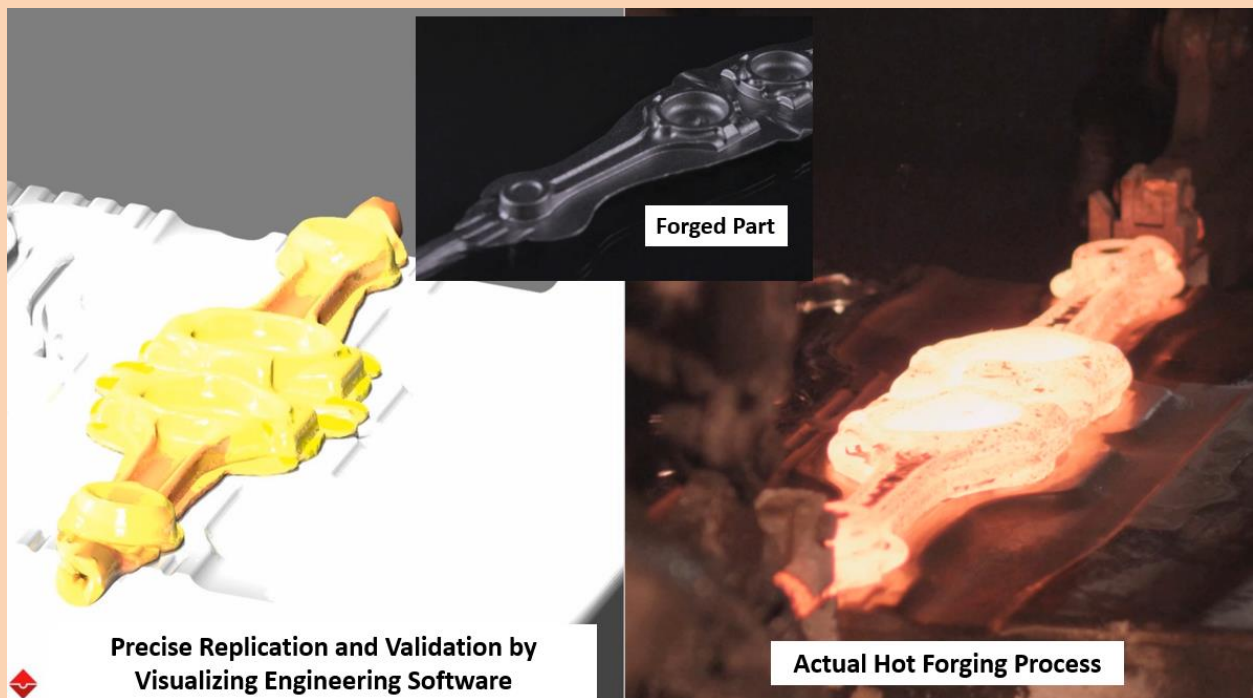
Extension of portion 2 $\frac{PL_2}{A_2 E_2} = \frac{25 \times 10^3 \times 750}{706.86 \times 1 \times 10^5} = 0.3155 \text{ mm}$

Therefore,
Total Extension of bar = $0.0981 + 0.3155 = 0.39062 \text{ mm}$

Answer obtained from software:
Elongation $\Delta = 0.39062 \text{ mm}$

The courses are designed and developed majorly from and for Mechanical Engineering and allied branches, but Students of other engineering fields may opt the topics of their interest, after investing time to study the pre-requisite topics. MSC Software along with its Partner Altem Technologies Pvt. Ltd. will prepare the Visualizing Engineering course in line with VTU syllabus and will map the workshops for each semester against the theoretical concepts being taught in that semester.

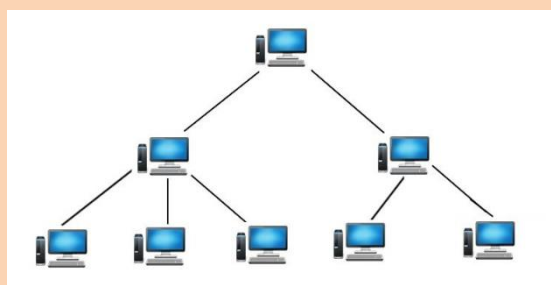
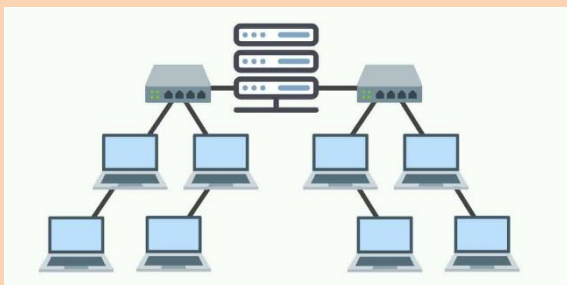
Multiphysics Simulation capabilities will allow all the Students and Faculties to carry out, in depth integrated and applied Research Projects in various Industry Sectors like Automotive, Aerospace, Robotics, Machineries, heavy Engineering & Consumer goods etc.



Visualizing Engineering® Concept will help All the Affiliated Institutions in following manner

1. Provide Better Visualization of the Engineering Theory & Concepts
2. Better Applied & Practical Understanding of the Concepts
3. More Problem Solving Using Mathematical Modelling & Software based approach to conduct what-if scenarios
4. More Practical's with Virtual Platforms
5. More Research Oriented Thought Process building
6. Incubating Higher Order Thinking
7. Enhancing Technical Skills with Industry Oriented & Practical Assignments
8. Visualizing Engineering® will allow institutions to carry out the Laboratory Practicals and Workshops virtually, which will be the need after COVID Pandemic.
9. Better industry-connect for researcher scholars and placement opportunities for students upon certification and recommendation by college faculty though the SkillConnect (Connecting Academia and Industry) initiative by Hexagon MSC Software.

About the Centre:



The license to these software packages will be provided through a secure centralized licensing server housed at VTU Belagavi and will be available for the systems in the COE Laboratory at VTU Belagavi and computer laboratories at individual participating Engineering Colleges Affiliated with VTU Belagavi. Training is provided by online means and Students and Faculties are free to use the software for any number of hours and provide feedback regarding the usability of the software. At least 40 Hours of online training at fixed timings will be provided complemented by e-learning subscription.

The Visualizing Engineering Licensing Server (Centralized Server) at VTU Belagavi Has the following configuration.

System Configuration for Visualizing Engineering Centralized Licensing Server at VTU Belagavi:

- Processor: Intel Core i5
- RAM Memory: 4GB
- Operating Systems: Windows 7 Pro (SP 1, 64 bit) or Windows 10 Pro (64-bit)
- Accessories: 3-Button Mouse and Regular Keyboard
- Graphics Devices: Monitor

The server-client connections to ping licenses should have sufficient bandwidth to support 500 client workstations each pinging the server from the five Nodal Center and Engineering Colleges affiliated to VTU, Belagavi for Training located at

1. VTU Belagavi
2. VTU Bengaluru,
3. VTU Mysuru
4. VTU Kalburgi
5. VTU Davangere

These 500 workstation systems at each Nodal Centers require uninterrupted connection to the centralized server in VTU Belagavi and Has the following configuration.

System Configuration for Workstation at Nodal Center and Engineering Colleges affiliated to VTU, Belagavi for Training:

- Processor: Intel Core 2 Duo, I7 and Intel Xeon, Intel Core 2 Quad
- RAM Memory: 8GB to 16GB
- Swap Space/Page File (Swap) = 1.5 times the memory size.
- Graphics Card: Graphics Driver with min 2 GB RAM
- Disk Space: SATA Hard disk (Min 50GB in C:\ Drive)
- Operating Systems: Windows 7 Pro (SP 1, 64 bit) or Windows 10 Pro (64-bit)
- Accessories: 3-Button Mouse and Regular Keyboard
- Graphics Devices (Monitor): 1280×1024 or higher resolution

Installation & Training of Visualizing Engineering software applications at all the Nodal Centers will be conducted by ALTEM Technologies and MSC Software Technical Team. Hands-on training at the above mentioned five Nodal Centers for college faculties during the train-the-trainers program is Key Highlight of this Initiative.

People involved with center of excellence: Details of Faculty, Staff, Visiting faculty, students

Name of Faculty	In charge	Contact details
Dr. Ravindra Malagi	Chief Implementation Officer	rrmalagi@vtu.ac.in
Mr. Prasad U Raikar	Nodal Coordinator Belagavi	puraiakar22@gmail.com
Dr. M Prasanna Kumar	Nodal Coordinator UBDTCE Davangerae	drmpkumar.dvg@gmail.com
Dr.V. M Kulkarni	Nodal Coordinator Kalburgi	vmkulkarni@vtu.ac.in
Dr. R Suresh	Nodal Coordinator Mysore	drsureshvtu@gmail.com
Dr. G S Venkatesh	Nodal Coordinator Bangalore	venkateshgs2007@gmail.com
Support Staff		
Mr.Guruprasad Kadagad	Software License management/ Scheduler/Installation	guruprasad@vtu.ac.in
Mr Vivek Kagwad	Software License management/ Scheduler/Installation	vkagwad@gmail.com

Facilities & services offered (with details):

SL No.	MSC Software	Short Description of Visualizing Engineering Software Package
1	MSC Nastran	Multidisciplinary Industry Standard Structural Analysis Simulation
2	Patran	Comprehensive Pre-and Post-Processing Environment Finite Element Modeling
3	MSC Apex	Unified CAE Environment for Virtual Product Development
4	Marc-Mentat	Advanced Nonlinear Simulation Solution
5	Adams	Advanced Multibody Dynamics Simulation Solution
6	Digimat	Nonlinear Multi-scale Material and Structure Modeling Platform
7	Digimat - AM	Application for Simulation of Additive Manufacturing Process of Polymer Parts
8	Easy5	Multi-Domain Modeling of Controls & Systems Simulation
9	scFLOW	New Generation CFD software with Multiphysics and General Purpose Capabilities
10	Dytran	Explicit Dynamics and Fluid Structure Interaction
11	Simufact Additive	Simulation Tool for Distortion Prediction in Powder Bed Additive Manufacturing
12	Simufact Forming	Simulate Metal Forming, Heat Treatment and Mechanical Joining Process
13	Simufact Welding	Simulate Complex Welding Processes, Predicts Distortions and Stress Relief
14	Sinda	Industry-Proven Advanced Thermal Simulation Solution
15	MSC Fatigue	Predict Fatigue Life, Durability and Damage Predictions (within Patran)

More Information Contact: coe.cae_bgm@vtu.ac.in

