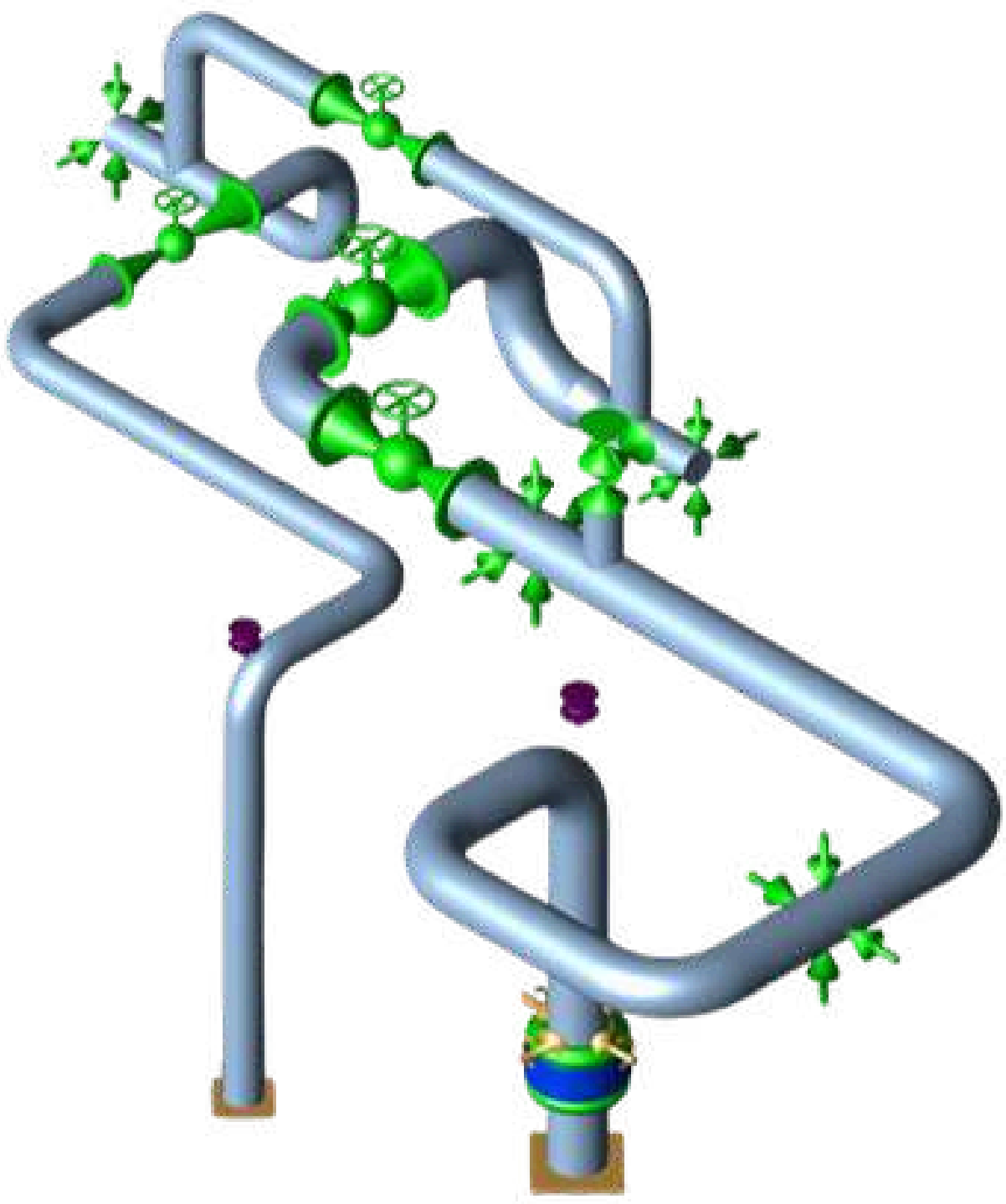
EXPRESS ENGINEERING SOLUTIONS

BASIC
PIPE STRESS ANALYSIS



No one can de-code the code like us...!

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CLICK THE TOPICS FOR DETAILS

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CLICK THE TOPICS FOR DETAILS

Course Content

1 Basic Pipe Stress Analysis (18 hrs)

Lecture No	Topics CLICK ON TOPICS FOR DETAILS	Hours (hrs)
1	Important Concepts Of Stress Analysis Part - 1	2
2	Important Concepts Of Stress Analysis Part - 2	1
3	ASME B31.3 Code Stress Equations Part - 1	1
4	ASME B31.3 Code Stress Equations Part - 2	2
5	Basic Load Cases	2
6	Introduction to CAESAR II & Basic Modelling Techniques	3
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9	Manual Stress Calculation Methods: Span calculation, Guided Cantilever Method & Flexibility	2
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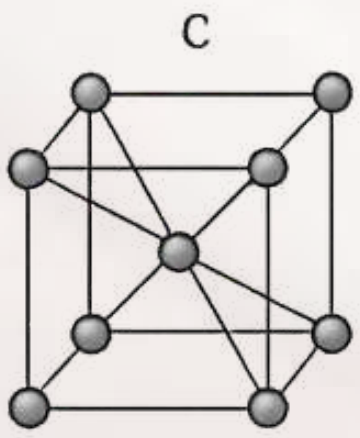
Course Content

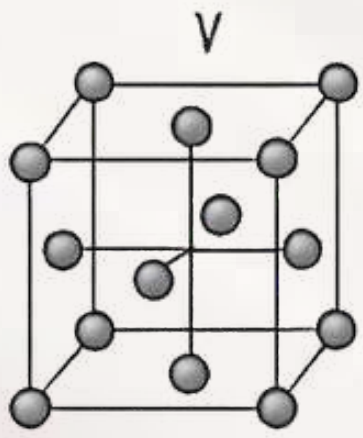
1 Important Concepts Of Stress Analysis Part - 1 (2 hrs)

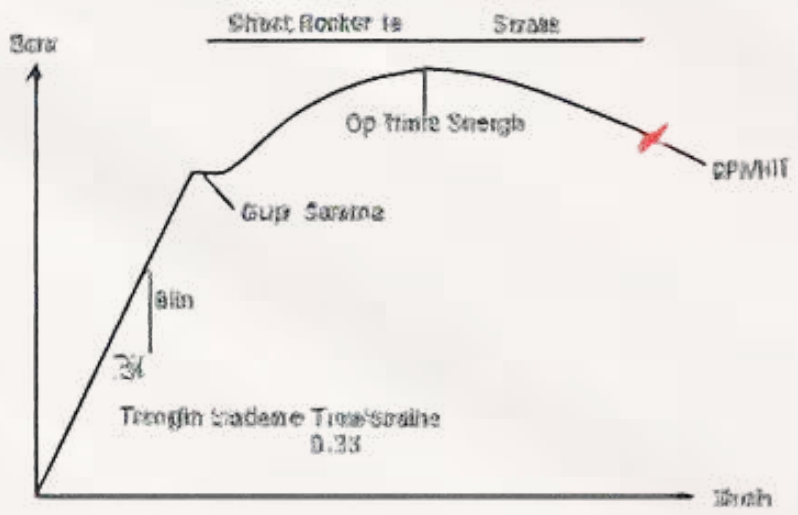
This Course is useful for all engineers who wish to make their basics clear in Pipe stress analysis. If you wish to 'Experience' the 'Stress Concept' and not only wish to understand it mathematically or in bookish language and the most importantly if you possess patience and passion for the subject then this Course is for you. This Course is divided in 3 nos. of videos.

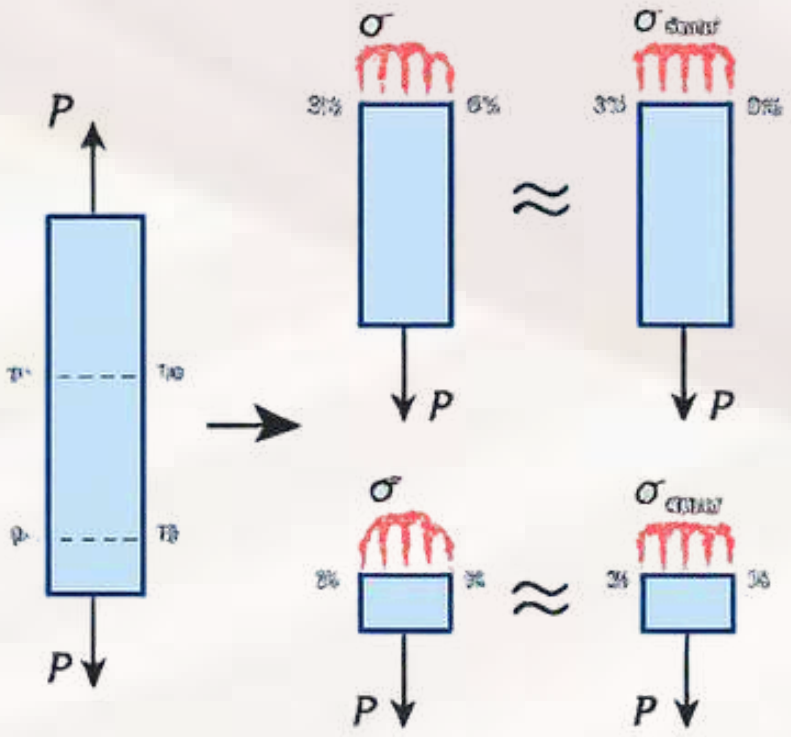
In these Courses we will discuss.

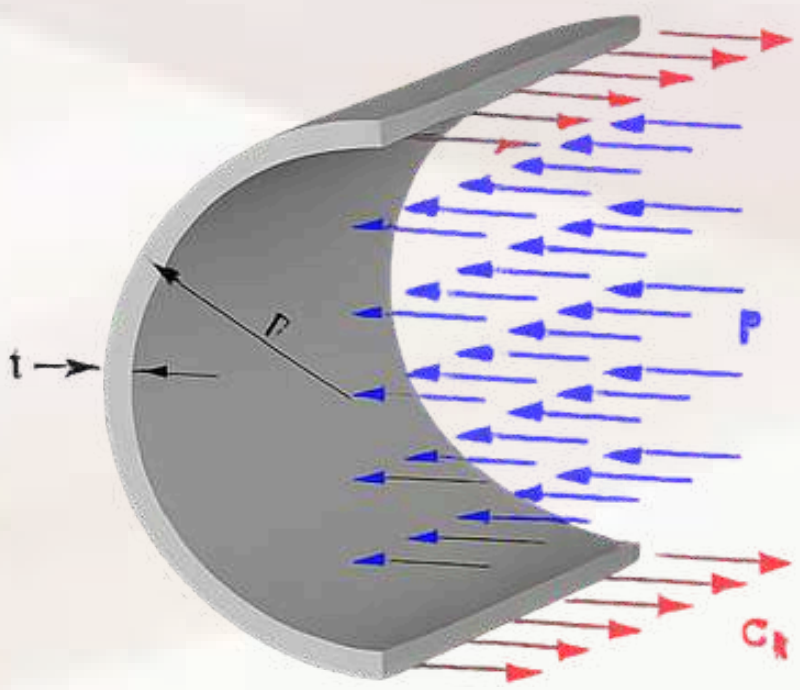
- The concepts of Displacement Filed, Stress & Strain Field,.
- Modulus of Elasticity and its significances.
- What is 'Tensor'? stress as a Tensor.
- Longitudinal stress, Radial stress, circumferential (Hoop) stress.
- Moment of Inertia.
- Stress stain curve and practical approach to look towards it.











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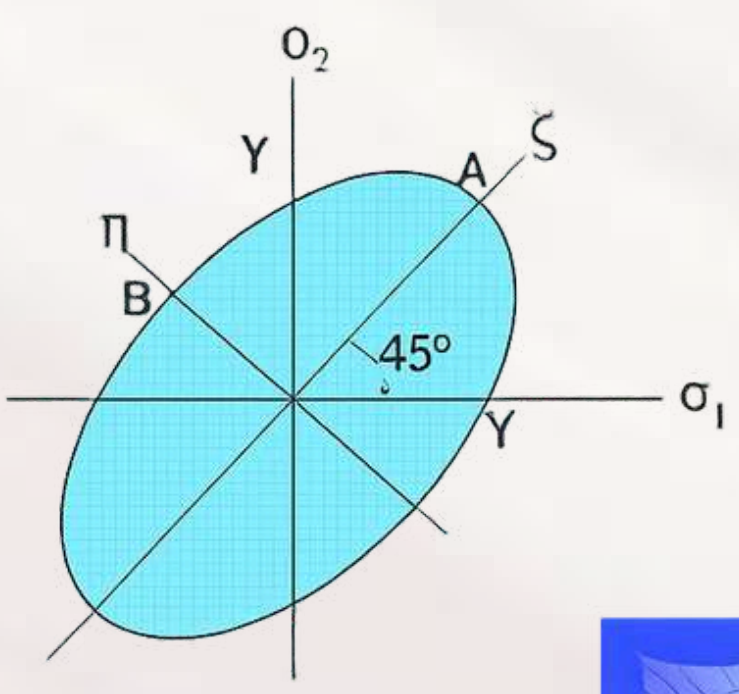
Course Content

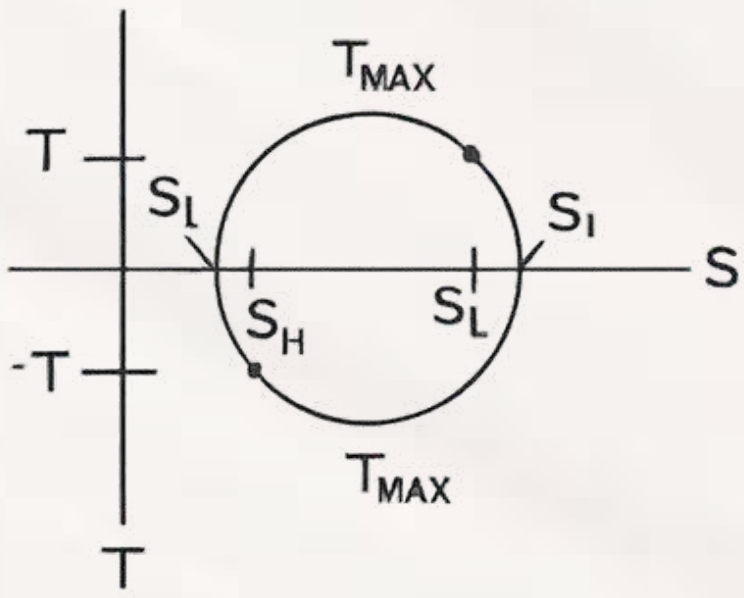
2 Important Concepts Of Stress Analysis Part - 2 (1 hrs)

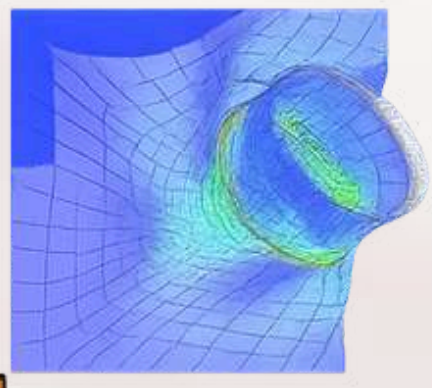
This Course is continuation of Course-1 and hence applicable for all Mechanical, production engineers irrespective of their experience. This Course is extremely recommended for the under graduates, fresh graduates, piping engineers, engineers working 3D state of stress, Mohr's circle, Theories of Failures: at site & stress engineers. We go little deeper into concepts like.

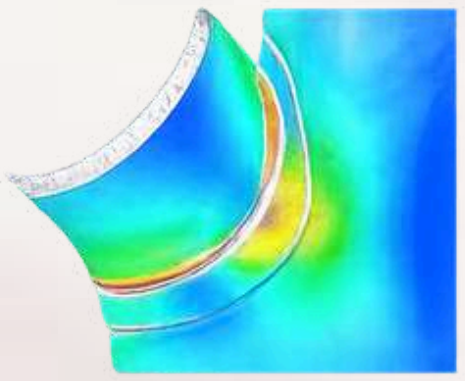
- 3D state of stress.
- Mohr's circle.
- Theories of Failures:
- Maximum Shear Stress Theory.
- Von mises theory.
- Importance of stress analysis.

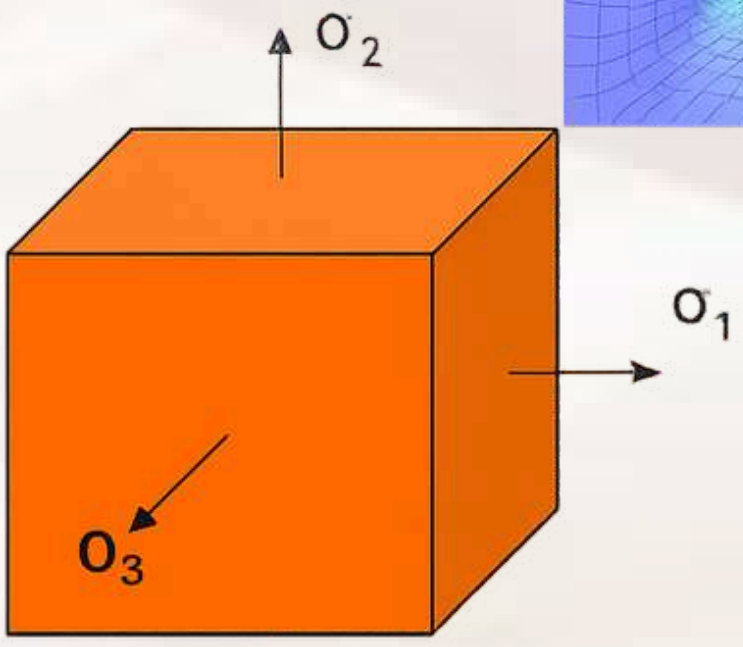
Also, a simple problem is solved by hand calculations to calculate the stresses in the system. The intention of this Course is to make the participant to look at the problem without taking help of software.











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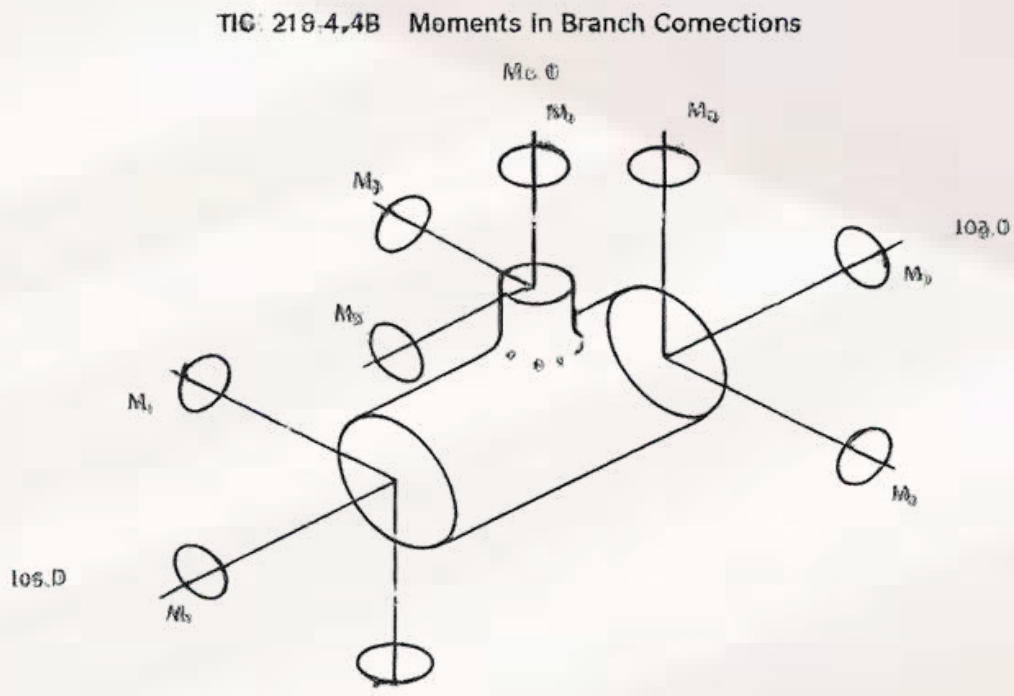
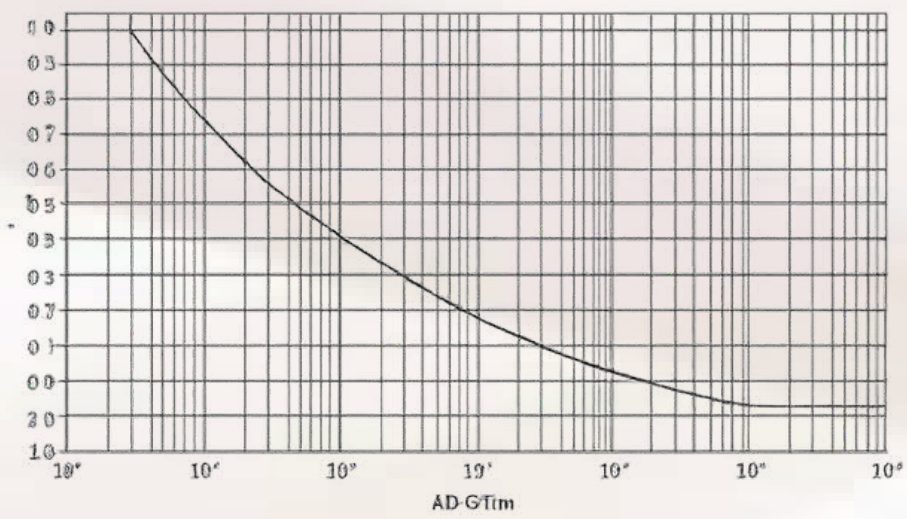
3 ASME B31.3 Code Stress Equations Part - 1 (1 hrs)

A highly recommended Course for all stress & piping engineers. There are various codes based on their applications. For example, ASME B31.1 is for Power piping, B31.3 is for Process Piping, B31.4 is for Liquid Hydrocarbon transportation etc. It is like ‘learning languages very close to each other’. If you know one language & its grammar well then it is simple to grasp other languages. Unfortunately, most of the Piping engineers do not read the code carefully, some of them ‘Read' the code but cannot 'interpret' it. The equations provided in the codes are followed as it is. However, all these equations are closely related to basic stress concepts & engineering theories which we learn in schools, concepts and engineering theories which we learn in schools, universities & if an engineer understands 'Why' behind the code equations, are written in a particular way then he/she gets an ability to relate them with new challenging problems. Also, it makes the understanding of code clear.

This Course talks about-

- Primary stresses and their characteristics
- Secondary stresses and their characteristics
- Occasional stresses and their characteristics
- Which type of stress is more critical
- Mode of failure of each type





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Course Content

4 ASME B31.3 Code Stress Equations: Part 2 (2 hrs)

This Course is continuation of previous Course and hence must be heard after completing Course 3. This talks about the code equations in detail.

- Why equations are written in a particular way.
- What is the significance of + and - sign?
- What is ‘stress range’?
- Stress relaxation.
- Self-springing of material.
- What are liberal stresses?
- Scope and Exclusions of ASME B31.3.
- Primary stresses equation and its allowable.
- Secondary stresses equation and its allowable.
- Occasional stress equation and its allowable.

$$S_L = \sqrt{(|S_h| + S_h)^2 + (2S_t)^2}$$

$$S_b = \frac{\sqrt{(I_i M_d)^2 + (I_o M_b)^2}}{Z}$$

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Course Content

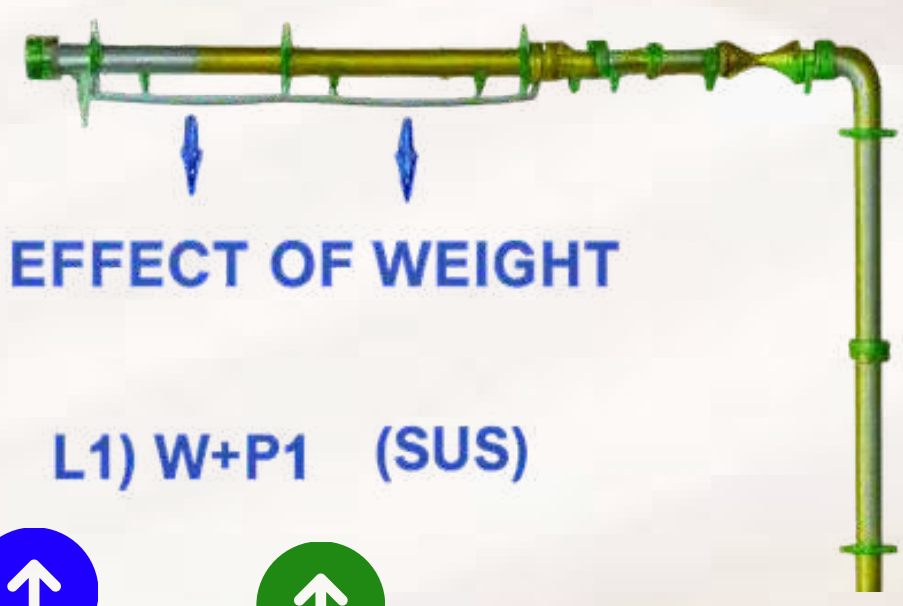
5 Basic Load Cases (2 hrs)

Defining the load cases is very important in pipe stress analysis as it is a relation between the software and the code requirements. Defining right load cases & understanding the mathematics behind the load cases is very essential. Most of the time it has been observed that engineers do copy the load cases or try to learn them by heart.

This Course talks about -

- How to write load cases their nomenclature
- There are various methods of combination such as scalar algebraic.
- Also, it tells about the answers of many critical questions like ‘why a particular load case is written in a particular way’?
- How to write the load cases using Caesar II software.
- What are the different types of load cases?
- How the allowable stresses are understood by the software when you call a particular load case by a particular name.
- How to write the load cases when a spring is introduced in the system.
- How to write load cases when force present in the system.

This model also relates the load cases with the code equations. This Course is extremely useful to the engineers with experience less than 5 years for those who wish to understand the mathematics and ‘Why’ behind the load cases.



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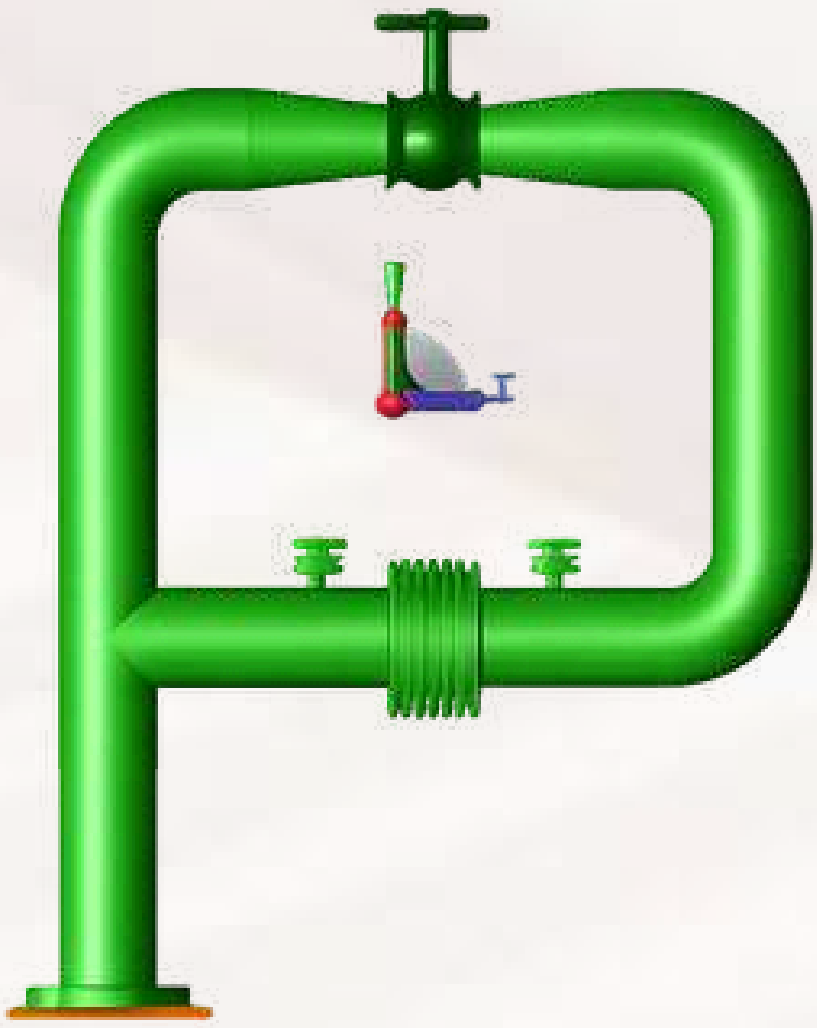
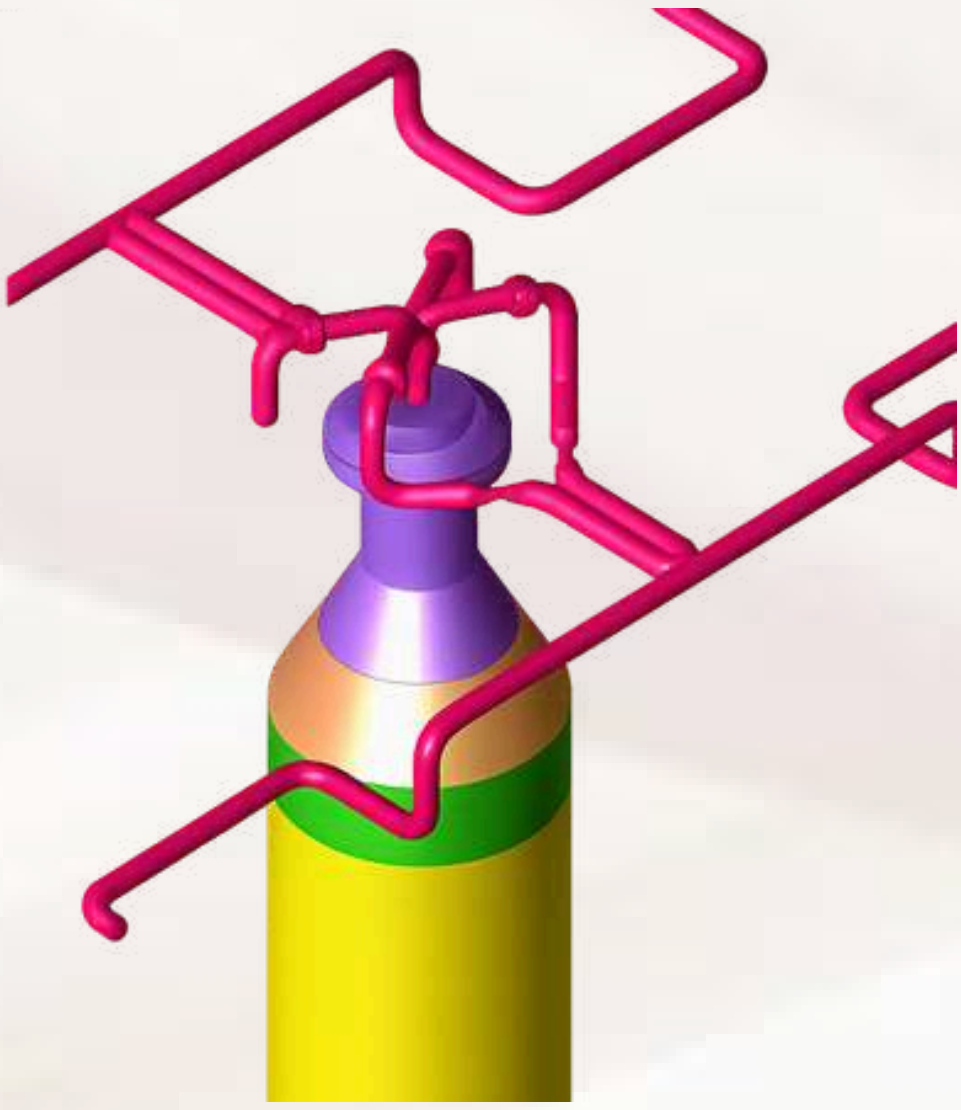
6 Introduction to CAESAR II & Basic Modelling Techniques (3 hrs)

Today's world is software driven. Engineers are no exception to it. It has been observed that engineers cannot give the solution without having software with them. Then it becomes essential to know the advantages and the limitations of the tool we are using. Hence knowing the stress analysis software and its advantages / limitations, the way it has been programmed etc. is very important. CAESAR II is one of the finest stress analysis software using beam element.

In this Course we will learn -

- Basic elements true In this Course we will learn.
- Hand calculation of thermal force and stresses. Evaluating them with scissor to answer.
- How software works.
- Important features of configuration setup.
- What is ‘degree of freedom’
- Introduction to modelling commands.
- Node and connecting Node, its application.
- How to apply wind and earthquake loads.
- Advantages and limitations of the software.
- Difference in in pipe element and rigid element.





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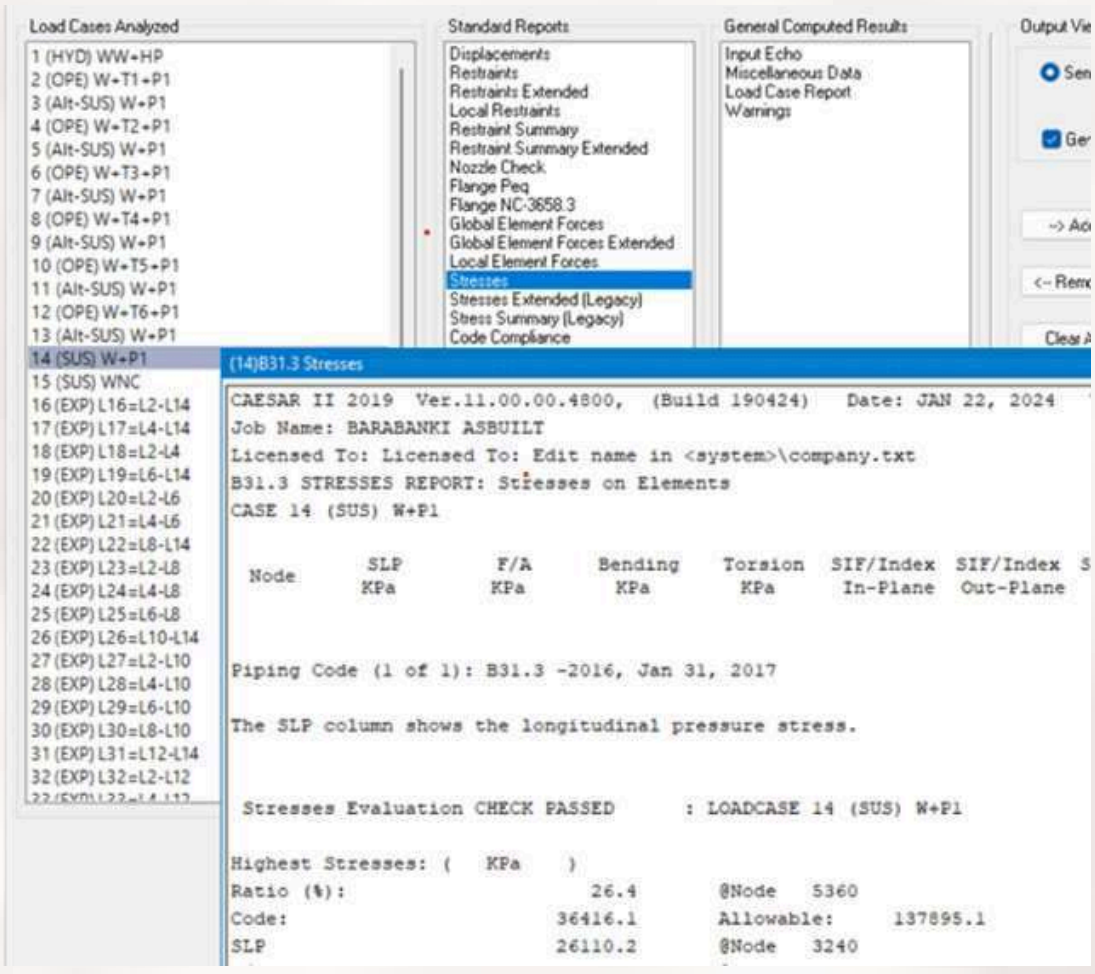
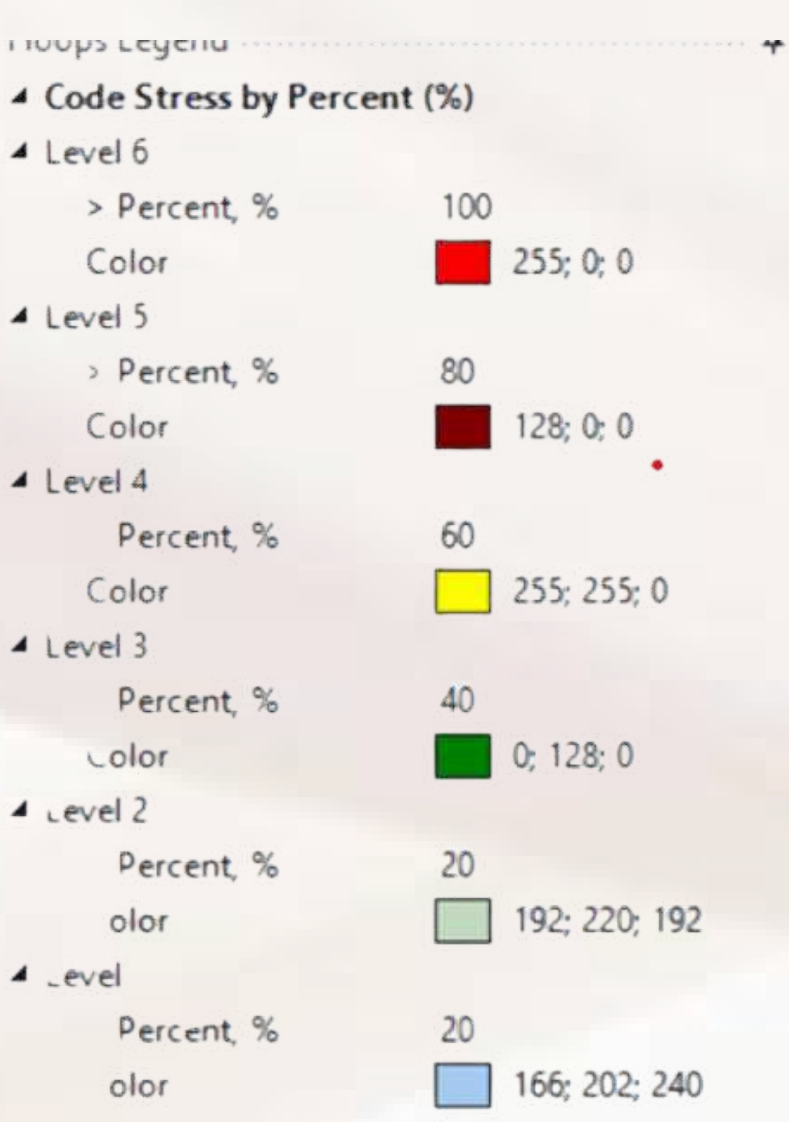
7 CAESAR II Load cases and Results (2 hrs)

Course number 7 is continuation of Course number 5. In Course number 5 we had learnt the theory about the load cases, How to write them, it's combination methods. In this Course we are going to learn how to build the load cases in CAESAR II software.

- What are the different features of this wizard?
- How to make the most out of the various advantages provided by the software.
- How to apply wind, earthquake, forces in the load cases.
- How to interpret the results.
- How to correlate the results with the code.
- How to identify whether liberal stress is on or not.
- How to interpret the positive and negative sign convention in CAESAR II.
- How to backtrack the sources of forces and stresses by integrating the results.





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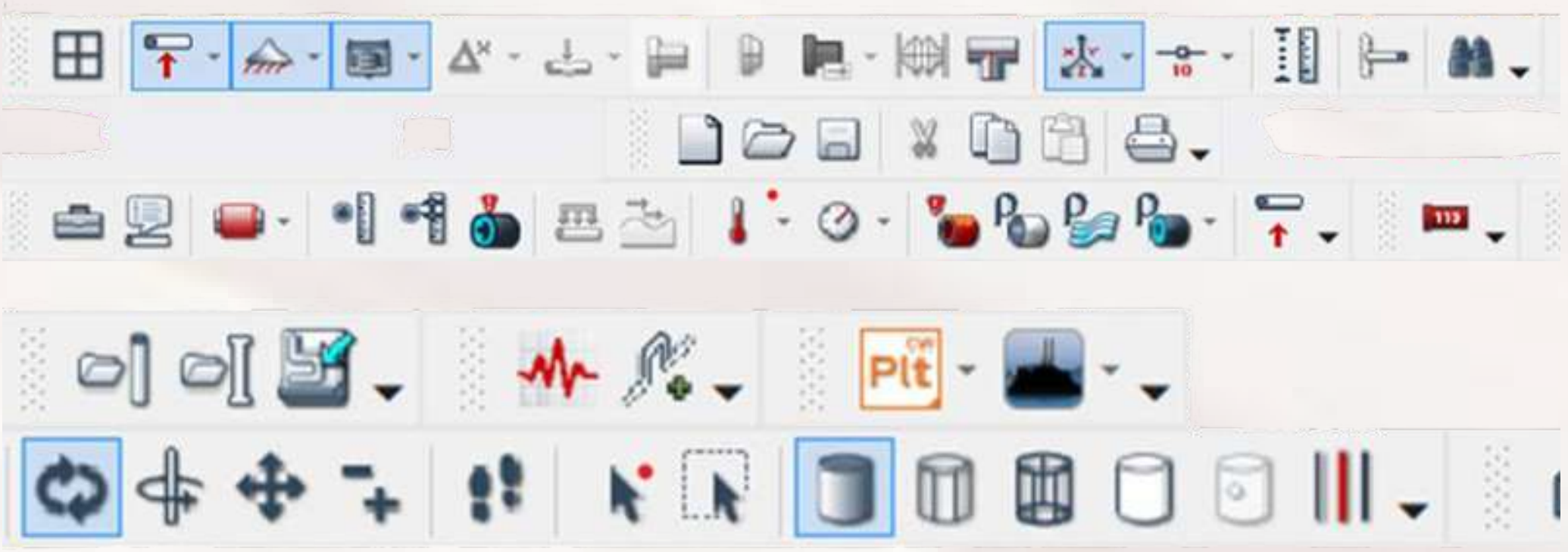
8 Miscellaneous: Modelling, analysis and Results (1 hrs)

After completing Course number no. 1 to 7 successfully now we have reached to a stage where we should start doing experiments. For a stress engineer it is the most essential to keep on trying, doing experiments, make changes into his /her model and look at the results. At the initial stage this 'trial and error' method is very effective to learn the stress analysis. At this stage engineer should start predicting the results of small model and verify it with CAESAR II software. The answers what we get teaches us a lot. This Course has been designed keeping in mind that the listener is new to the software.

- In this model we will learn.
- Study the effects of temperature, supports and layout on the results.
- How to reduce the forces and moments.
- Basic techniques how to solve a stress system, comparing the results.
- Learn few handy commands like Copy, duplicate and rotate.
- Liberal stress and its effect on allowable stress.



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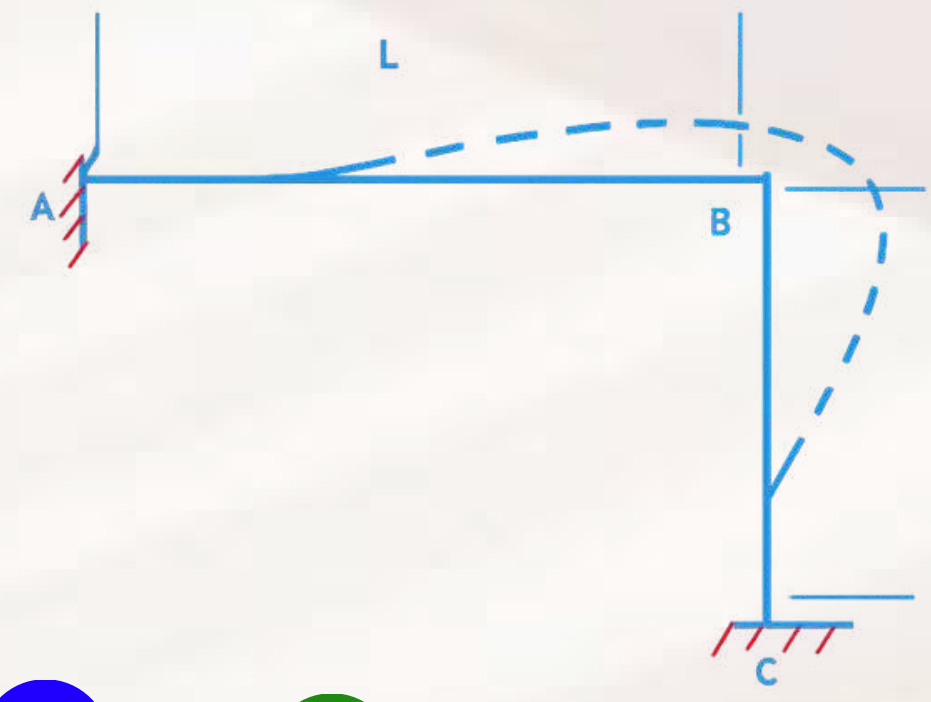
9 **Manual Stress Calculation Methods: Span calculation, Guided Cantilever Method & FlexibilitY** (2 hrs)

Our trainer strongly believes that when any stress analysis problem comes in front, the solution of that problem should get first formed in your mind. Then one should model it accurately into the software & then look at the results. If the results are as per your predictions then you are on the right track & if not then you can correct your understanding by looking at the results given by the software. In this journey it is very important to know how our ancestors or the previous generation of the engineers used to perform the analysis when they did not have such a sophisticated software. In this Course we are going to learn ‘how to calculate SPAN of a pipe’ based on ‘allowable stress’, ‘ Allowable deflection’ & natural frequency. Further we will learn a method called “Guided cantilever method”. This method was the basis to determine the minimum required flexibility into the piping system when we had no software. Based on this method number of graph, charts were developed. In this Course we will understand the theory of guided cantilever method, we will solve a problem using hand calculations based on this method & then we will verify the same problem using Caesar II software. We will look into the results & try to compare it with the hand calculation & we will try to learn the accuracy of this method & its limitations as well.



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10 Pipe supports & their applications (2 hrs)

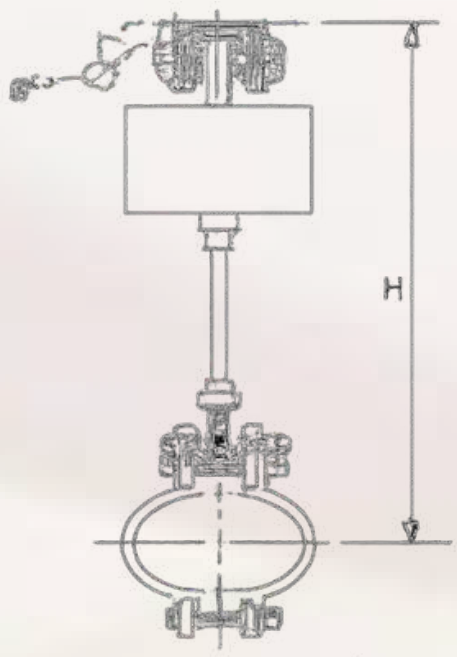
The final outcome of the extensive stress analysis is nothing but 'IFC isometric' which means 'Issued for construction' isometrics. In these isometrics we get a final pipe route and type of supports which have been approved and recommended by the stress engineer. Here all the wisdom, knowledge and experience of a stress engineer gets converted into the selection of right type of supports.

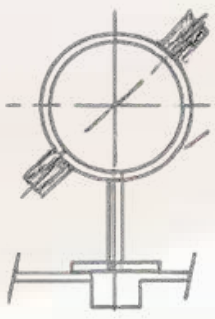
There are various kinds of supports such as rest supports, guide supports, limits stops, springs, snubbers, Struts. Each support has got its own unique features. Hence understanding the language of stress analysis software and then converting them into a appropriate support is very essential.

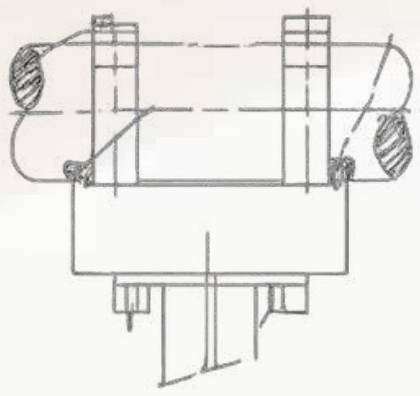
In this Course we are going to learn -

- Different types of supports, their applications.
- Where to use which type of support.
- Do's and don'ts about support.
- How to read arrow marking on stress iso and converting it in physical supports.
- Simple supports and few complicated supports.
- Primary supports and secondary supports.

This Course is useful for piping engineers, designers, stress engineers, mechanical contractors at site & civil engineers.







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About Us

Why Choose Us

With vast domain experience, highly capable & equipped Engineering Team we are specialized in providing the most professional Engineering services with fast turn around time. We also help businesses meet their goals with our cutting edge Engineering & Training services.

Mission

Our mission is to deliver world-class engineering solutions with simplicity, precision, and speed, while empowering professionals through comprehensive training that meets global industry standards.

Vision

To create a future where our cutting-edge expertise in engineering solutions and professional training empowers both clients and the industry, making us an indispensable partner in their success.

Our Core Values

1) INNOVATION

We consistently challenge the status quo by exploring new ideas & technologies to deliver creative, cutting-edge solutions.

2) INTEGRITY

We operate with unwavering honesty & transparency, building lasting trust with every client and partner.

3) CUSTOMER FOCUS

We are committed to understanding our clients' unique challenges & providing tailored, value-driven solutions.

4) ETHICS

We collaborate & support one another, believing our collective strength drives the best results for our clients.

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Know The Trainer

Gaurav Bhende

Gaurav has **22+ years of experience** in Oil & Gas, Process, Petrochemical industry. He is specialized in **Piping / Pipelines Stress Analysis** (Static and Dynamic) and Design. He has great experience in Professional Trainings. He has Presented **white papers** in international conferences including ASME conferences. He has Played a key role in establishing Stress engineering group and lead the Stress Group in Worley Parsons, Abu Dhabi and Mott MacDonald, Mumbai. He has worked with renowned organizations like Worley Parsons, Mott Mac Donald, Chemtex Global Engineering and Jacobs Engineering. Gaurav has completed his M. TECH. (Specialization in Machine Design) from VJTI, Mumbai. & Post Graduate Diploma in Piping Engineering. Gaurav is a member of 'American Society of Mechanical Engineers' & 'Institute of Engineers – India.

Gaurav's Achievements-
First Prize winner of "Drivers of Success" competition for years (2011 & 2012) hosted by Intergraph.
Participated HxGN 2013 global conference as a speaker on topic,
"Effect of Modeling Supports with CII's Structural Module on Static and Seismic Analysis".

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Who Should Do This Course?

How We Can Help..!

This course is designed for engineers & professionals involved in the **design, analysis, & support of piping systems** across industries such as **oil & gas, petrochemical, power, marine, and process plants.** It is suitable for individuals at various stages of their career seeking practical skills in pipe stress analysis.

1. **Mechanical / Piping Engineers**
   Professionals responsible for the **structural & stress evaluation of piping systems in plant design, expansion, & modifications.** The course equips them to efficiently analyse loads, thermal effects, supports, & compliance with codes.
2. **Stress Engineers**
   Engineers specializing in stress analysis who need to **strengthen their technical competence** with practical CAESAR II modelling, **evaluation, & result interpretation.**
3. **Engineering Graduates & Entry-Level Engineers**
   Recent graduates or early-career engineers seeking **foundational & applied knowledge** of pipe stress **principles & industry workflows** using CAESAR II.
4. **Project Engineers / Project Leads**
   Professionals overseeing **piping design packages** & ensuring deliverables comply with engineering codes & client specifications.
5. **Piping Design Managers / Technical Leads**
   Managers or team leads aiming to **upskill their teams** or **enhance their own understanding** of stress analysis criteria, deliverables, and software capabilities.
6. **Contractors / EPC Engineers**
   Engineers working with EPC (Engineering, Procurement, & Construction) firms who require hands-on expertise to **perform contract deliverables** for stress analysis or to **review vendor/consultant submissions.**

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Who Should Do This Course?

How We Can Help..!

7. QA/QC Personnel

Quality assurance & control professionals involved in **reviewing stress analysis** deliverables, **ensuring compliance with regulatory standards,** & enforcing best practices.

8. Consultants & Independent Analysts

Consultants who **perform third-party reviews, validation, or specialized stress assessments** for clients across multiple sectors.

Who Will Benefit Most

- Professionals seeking career advancement in mechanical/piping/stress engineering.
- Individuals moving into roles with greater responsibility for design validation and compliance.
- Engineers preparing for industry certifications or competency assessments.
- Teams that want a common technical baseline & standardized deliverables.

Prerequisites (Recommended but Not Mandatory)

- Basic understanding of piping design and mechanical engineering fundamentals.
- Familiarity with general engineering concepts like loads, supports, material properties, and basic statics.
- Prior exposure to any engineering software is beneficial but not required.

While CAESAR II provides powerful tools for modelling & analysing piping systems, relying solely on software outputs can be risky. Our course emphasizes a balanced approach, combining manual engineering calculations with software analysis, ensuring accuracy, reliability, & code compliance.

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Who Should Do This Course?

Key Highlights

Engineering Fundamentals First

a) Understand the theory behind pipe stress, thermal expansion, sustained and occasional loads.

b) Learn how to perform hand calculations for simple scenarios to verify software results.

Validation of Software Outputs

a) Learn techniques to cross-check CAESAR II outputs against manual calculations.

b) Identify potential modeling errors, unrealistic boundary conditions, or overlooked loads.

Develop Practical Engineering Judgment

a) Gain the ability to interpret CAESAR II results critically, rather than accepting them blindly.

b) Understand when software results are plausible & when corrective action is required.

Compliance with Industry Standards

a) Reinforce ASME code compliance by comparing hand calculations with software analysis.

b) Ensure that deliverables meet EPC and client expectations for accuracy, safety, & professionalism.

Enhanced Career Competence

a) Engineers trained in both manual calculations and software validation are highly valued by employers.

b) This dual skillset ensures the engineer can **solve complex problems independently** & confidently justify design decisions.

Our course ensures that you not only master CAESAR II software but also retain the core engineering skills needed to validate and trust your analysis results.

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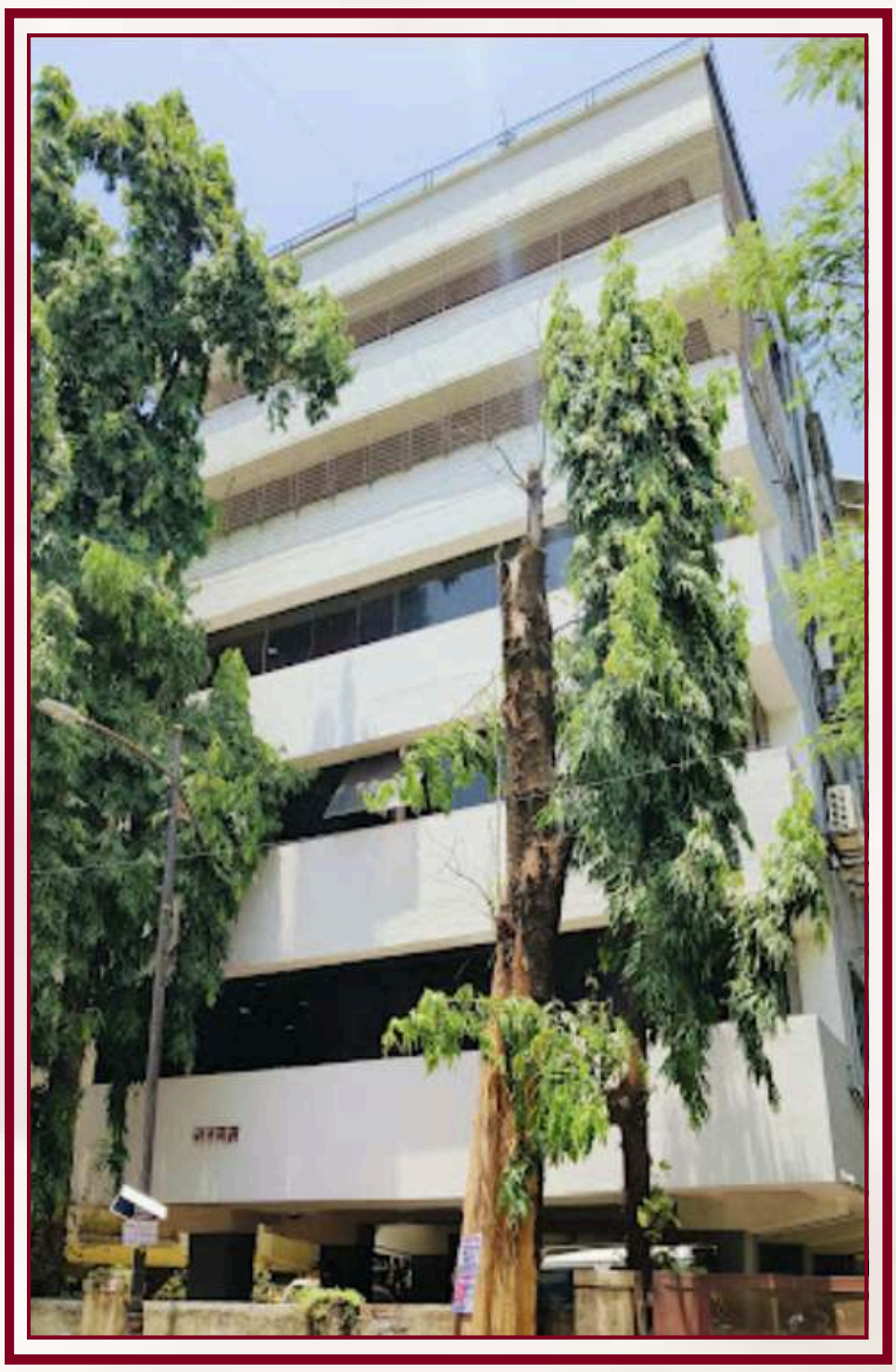
Design Services

About Us

With a vast experience in Static Equipment Engineering, we offer the best, cost efficient solutions to our customers. Our Engineering team is capable to deliver Design of Pressure Vessel, Heat Exchanger, Condenser, Reactor, Column, Storage Tank, and other static equipment, as per various national and international codes and standards.

The team is well experienced and trained to deliver Design as per ASME Sec VIII Div-1, Div-2, PED, ADMerk Blatter, PD5500, AS1210, GOST, TEMA, API 660, API 650, API 620, IBR, EN13445, etc.

We have successfully completed many ASME U-stamp audits and worked on hundreds of U-stamp vessels closely with many certifying agencies.



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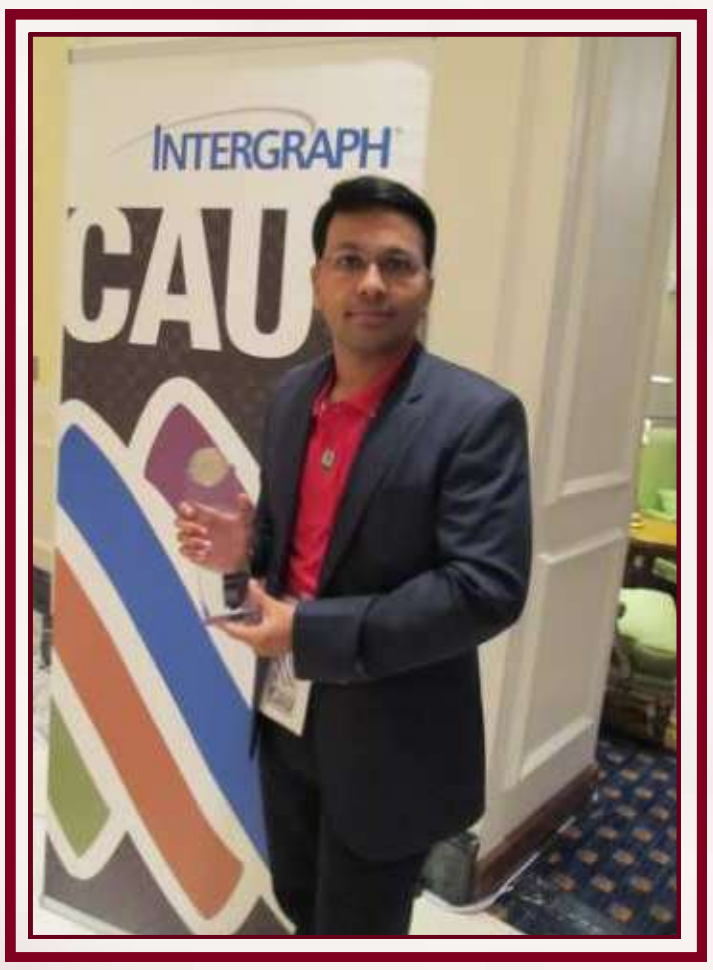
Training Services

About Us

Our training program offers a unique and professional platform for engineers to master their skills to meet the demanding requirements of industries. As an Authorized Training Provider for ASME, we stand firmly behind our mission: “**No one can decode the code like us.**” This expertise is rooted in our deep understanding of various national and international standards, delivered by **seasoned industry veterans** who are currently active in their fields to bridge the gap between theory and real-world application.

Drawing on extensive multi-disciplinary expertise, we provide **comprehensive** courses tailored to the rigorous demands of today’s market. In a remarkably short time, our **commitment to excellence** has established us as the most trusted and preferred training partner for leading corporations and ambitious individuals globally.



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Corporate Training

Onsite Corporate Trainings

We have been instrumental in developing the manpower for organizations through our onsite training under our corporate training program. These training have helped the corporates to develop the skills and knowledge of their resources and as a result increase the output with better and optimized design of equipment.

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Our Customers

Our Corporate Customers

We have been instrumental in developing the workforce for organizations through our onsite training under our corporate training program. These training has helped the corporates to develop the skills & knowledge of their resources & as a result increase the output with better & optimized design of equipment.

LEWA Creating Fluid Solutions
PESCO
شركة الزامل للصناعات المعدنية الثقيلة AL ZAMIL HEAVY INDUSTRIES LTD.
Quality International
SIGMA ENGINEERING WORKS
VeeTech

قافكو QAFCO شركة قطر للاسمدة الكيماوية QATAR FERTILISER COMPANY
KROHNE
FABTECH
JMS Johar Manufacturing Services LLC
فابكون FABCON

DOLPHIN GLOBAL HOLDINGS
TOYO ENGINEERING
L&T
PALL PALL CORPORATION
prestige ENGINEERING
Glatt
KNM

habu Technology FZCO
praj Innovate • Integrate • Deliver
T.EN TECHNIP ENERGIES
PROTECTS Tetra Pak WHAT'S GOOD
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HP
THERMAX

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TI
MARMON
Crystal industrial
PADMATECH INDUSTRIES PVT LTD
Transheat Technologies

HEXAGON
KOCH FLOW TECHNOLOGY
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kirloskar Chillers

pharmadule A Morimatsu Group Company
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protton synergy +vely charged
unitop aquacare
ISGEC ISGEC HEAVY ENGINEERING LTD.
CRYOLOR ASIA PACIFIC
wood.

ALKYL
GRAHAM ENGINEERING ANSWERS A GHM COMPANY
desmet ballestra Science behind Technology
FORBES MARSHALL

CPG CHANDERPUR GROUP
Alleima
LONE

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Our Track Record

How We Have Been Doing..!

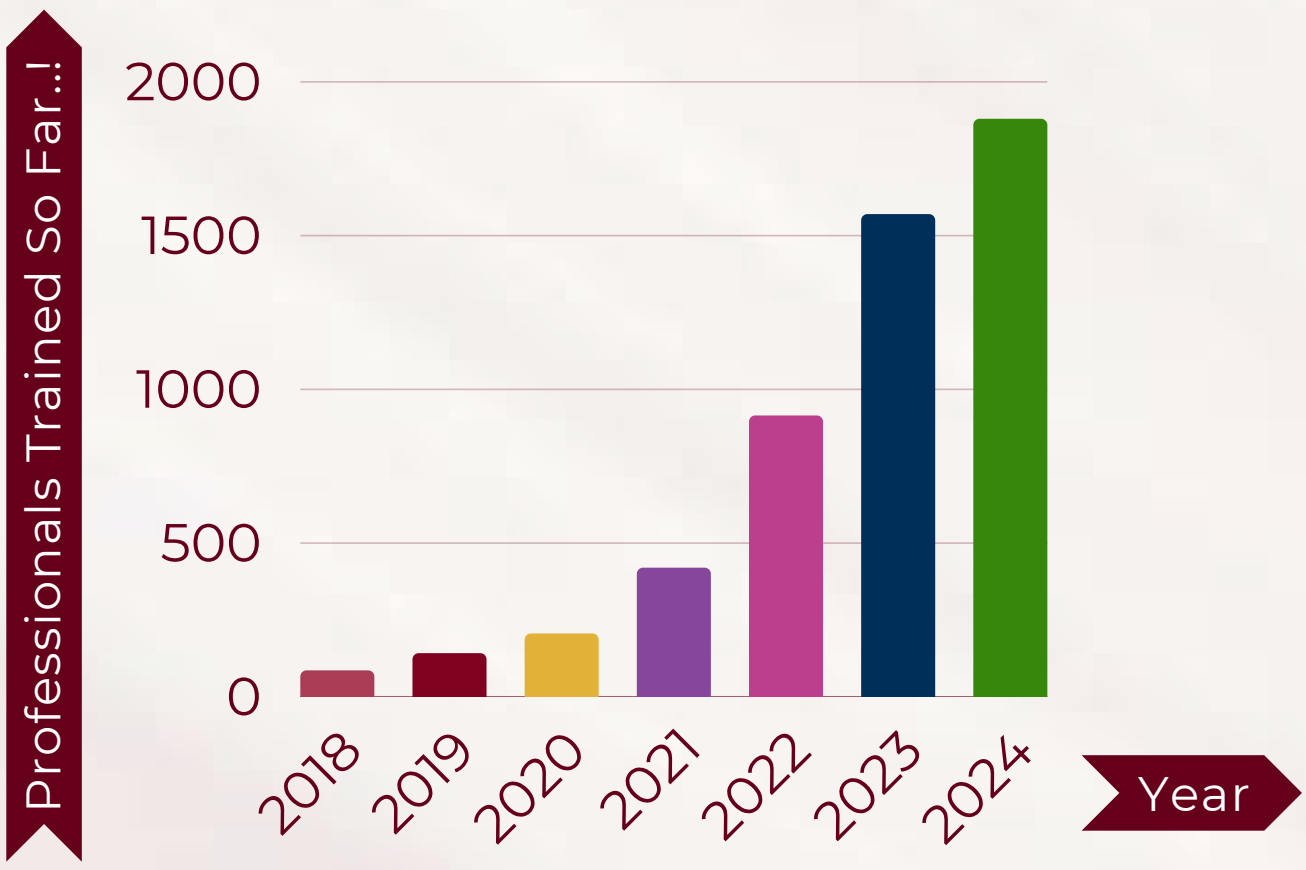
100+ Corporate Customers

4000+ Satisfied Trained Individual Online & Offline Combined

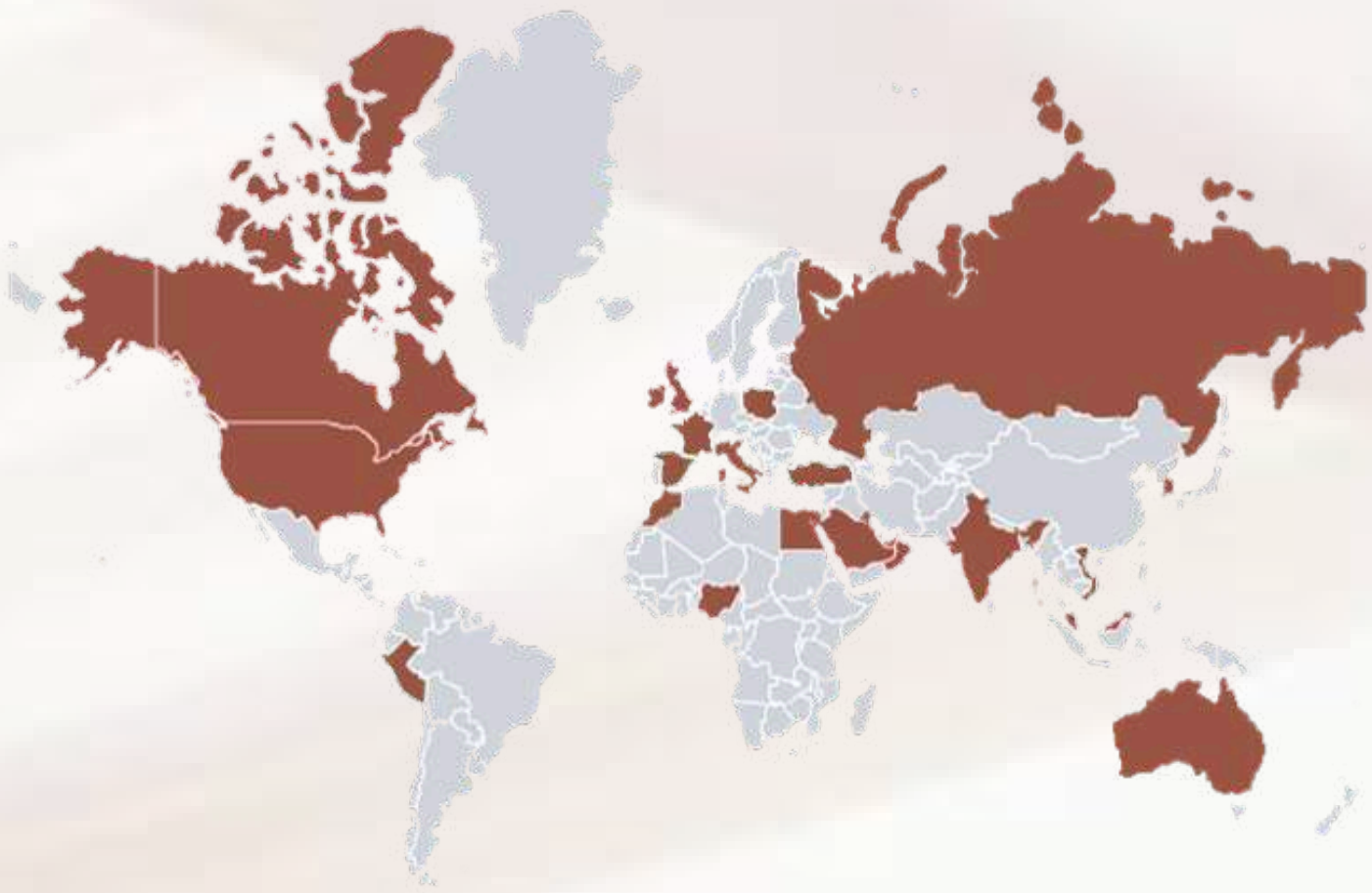
20+ Countries With Beneficiaries Across The Globe

0-28 Experience Range Of Engineers Trained

Over The Year...!



Beneficiaries Across The Globe



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About Training Platform

Mobile & Laptop/ Desktop

Expert and Professional training available at your convenience, with our Mobile & Desktop application.

WATCH FREE LECTURE VIDEOS

GET IT ON Google Play

Download on the App Store

PLAYSTORE

IOS APP

use organization code yatgi

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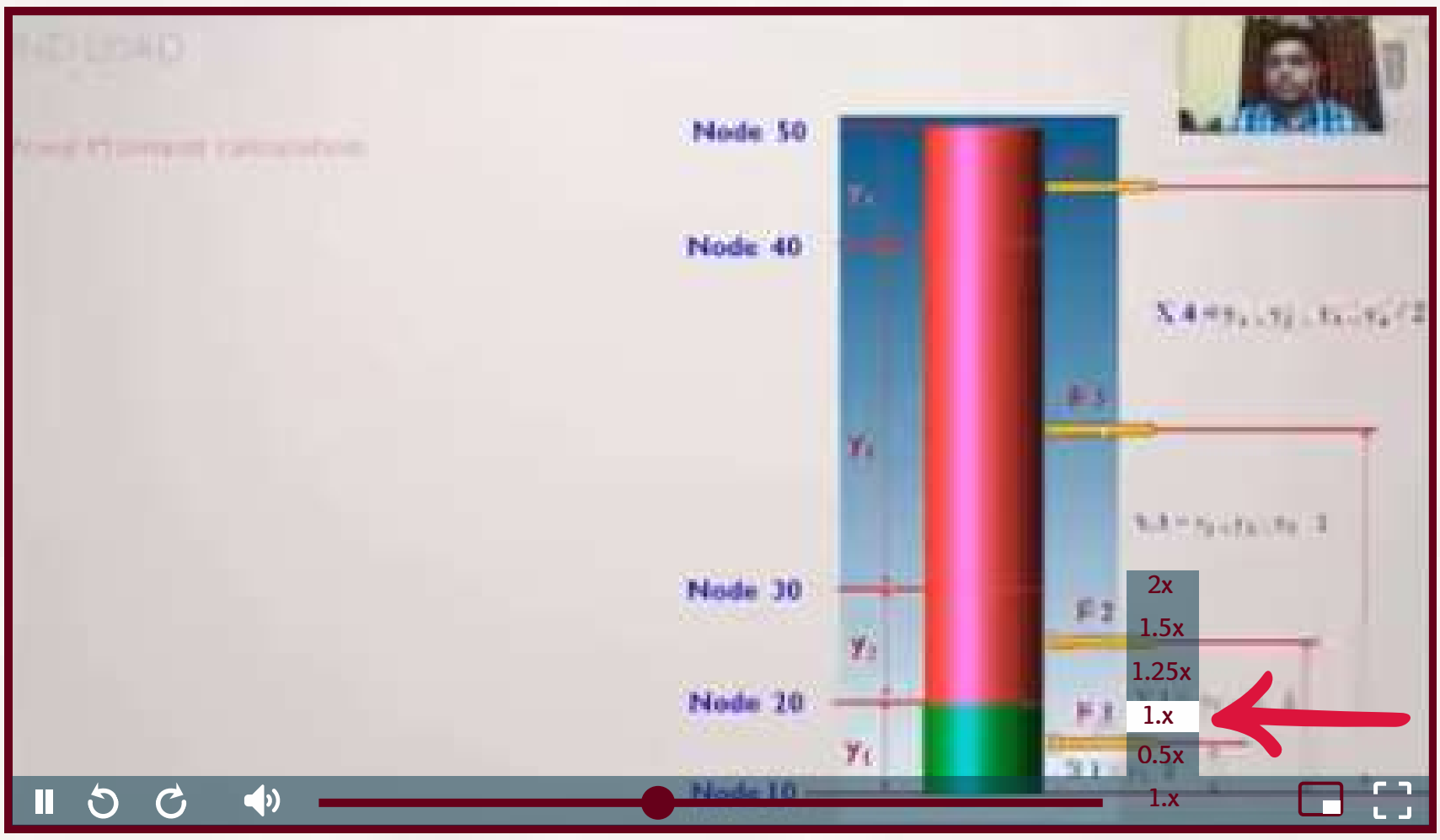
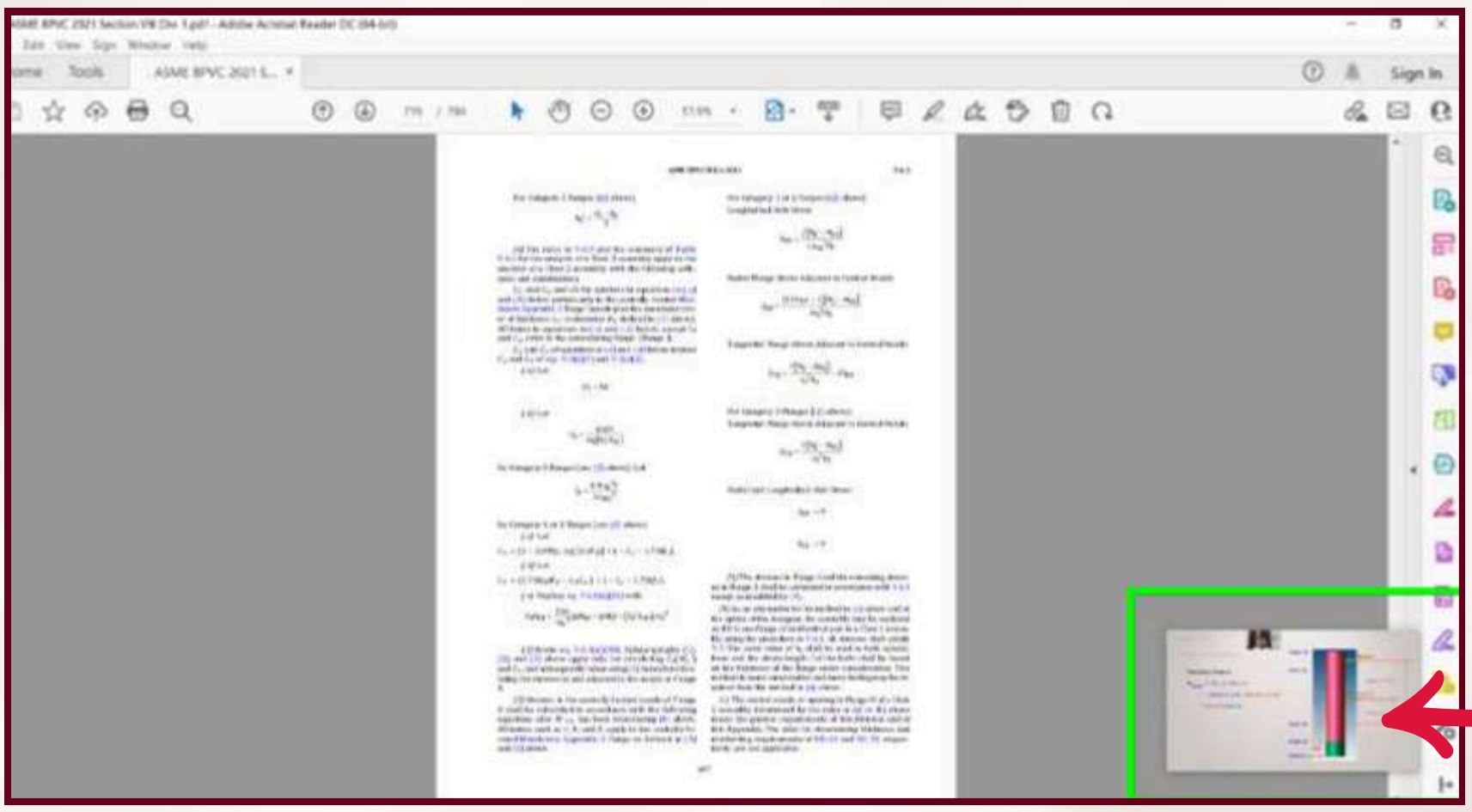
About Training Platform

Special Features

It has never been so convenient to learn...! Check out some special features of our Training Platform. Adjust video speed from 0.5x to 2x to suit your requirement.



PIP mode enables you to work or practice simultaneously while watching the lectures.



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Advantages Over Offline Courses

Benefits Of Online Training

Offline	Online
No more compromise on work or personal schedule	
Getting late for the class. **Need to rush** or I'll miss the lecture.	I can **save travelling time** and **avoid stress** by watching lectures online **as per my convenience.**
Get answers on the go...!	
I am stuck in the Project. But this topic is scheduled after 4 weeks in the live class. **How can I solve it now?**	I was stuck..! But I **just watched this topic online** and bingo..! **the problem is solved.** I simply love this platform.
Live Q&A session every week	
The Classes are over. **Whom can I ask** the questions now?	My Course **validity is 18 months**. Also the **live Q&A** session is **twice a week.** I can get all the answers.

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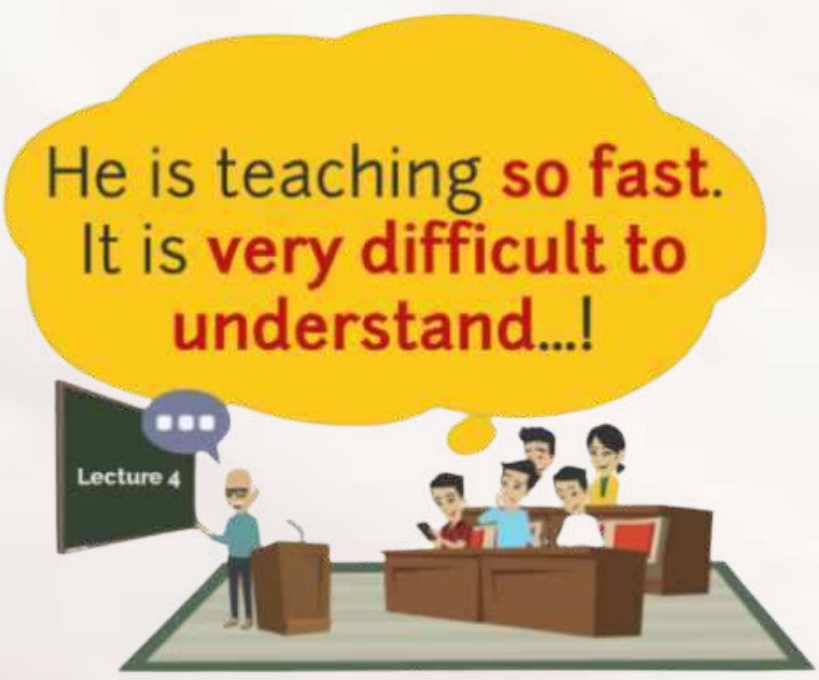
Advantages Over Offline Courses

Benefits Of Online Training

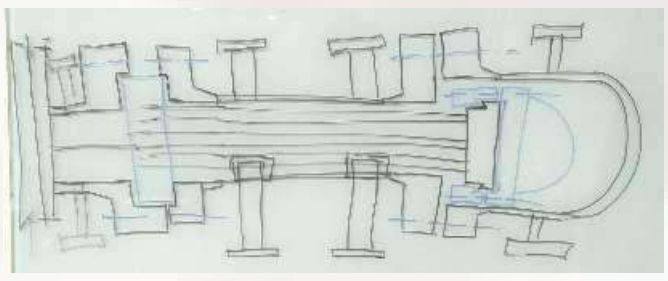
Offline	Online

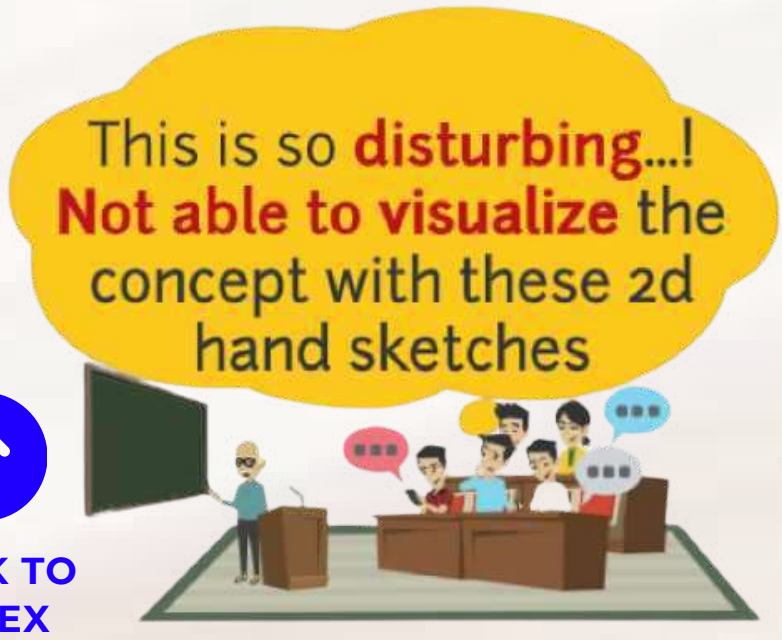
Never Miss Out On Any Lectures

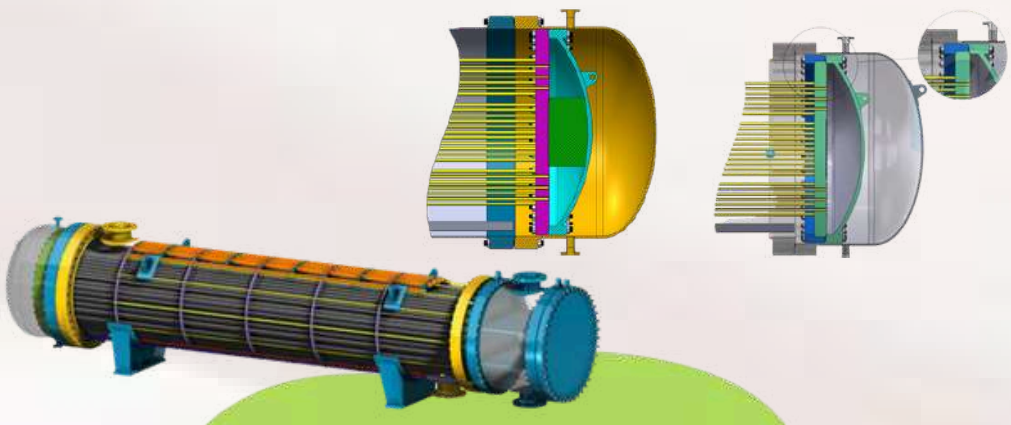
Learn At Your Own Pace



No Disturbances | Video Lectures | Animations







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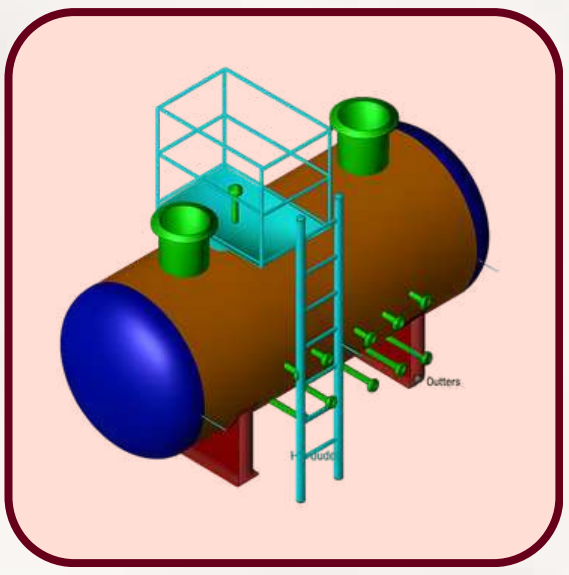
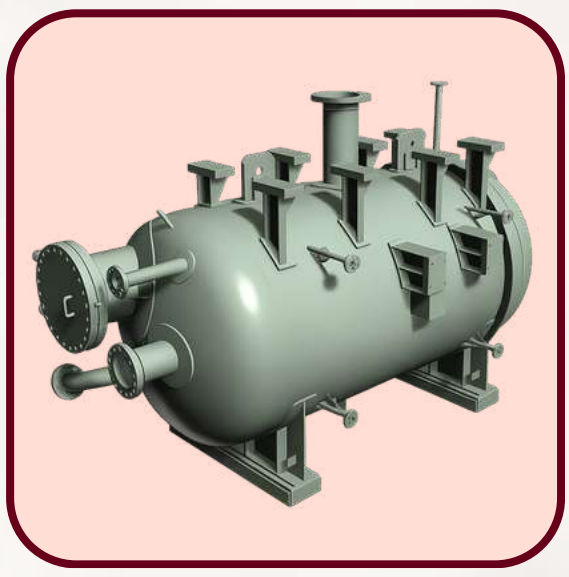
Our Other Courses

STATIC EQUIPMENT DESIGN

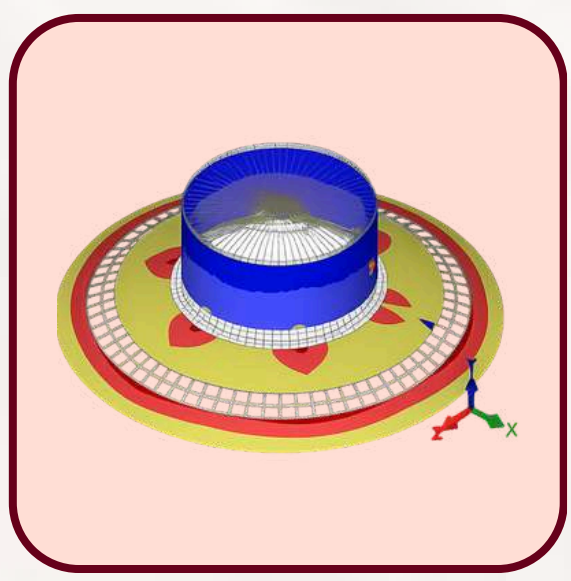


PRESSURE VESSEL DESIGN (DIV 1)

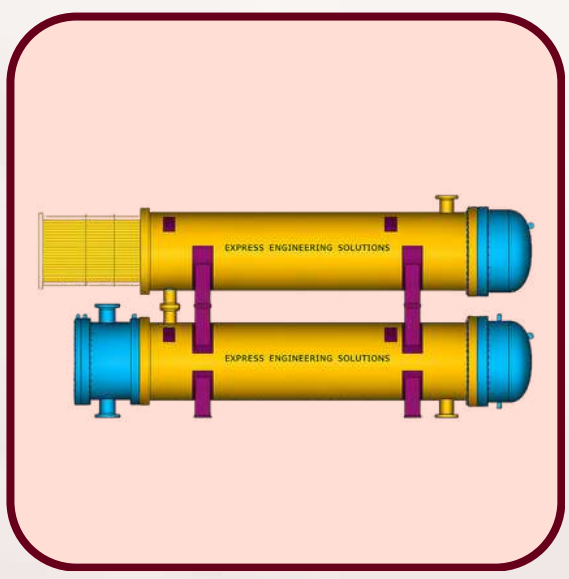
PRESSURE VESSEL DESIGN (DIV 2)



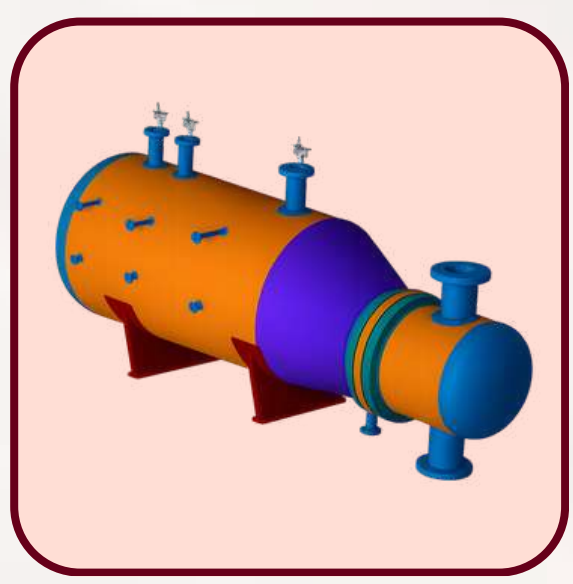
PREMIUM COMBO



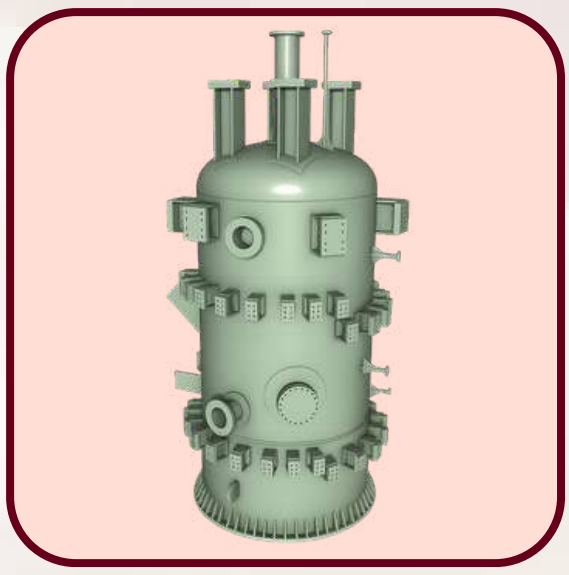
NOZZLE PRO FEA



HEAT EXCHANGER DESIGN



PV ELITE SOFTWARE



DIV 1 & DIV 2 COMBO

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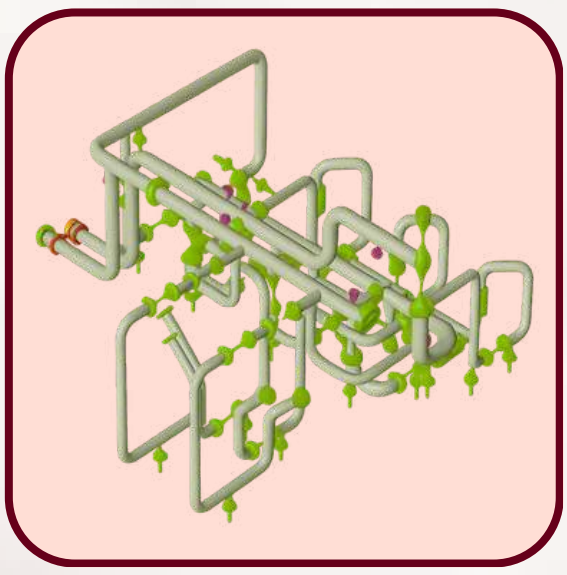
Our Other Courses

ASME AUTHORIZED COURSE

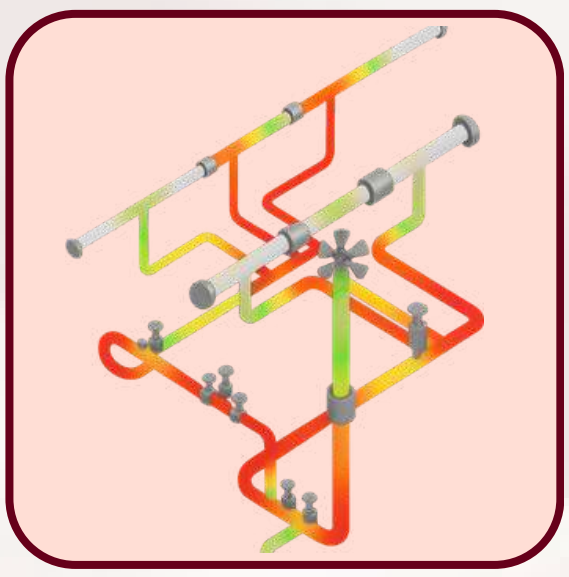
ASME PD442

PIPE STRESS ANALYSIS



ADVANCE PIPE STRESS ANALYSIS

BURIED PIPELINE STRESS ANALYSIS



COMBO PIPING & PIPELINE STRESS ANALYSIS

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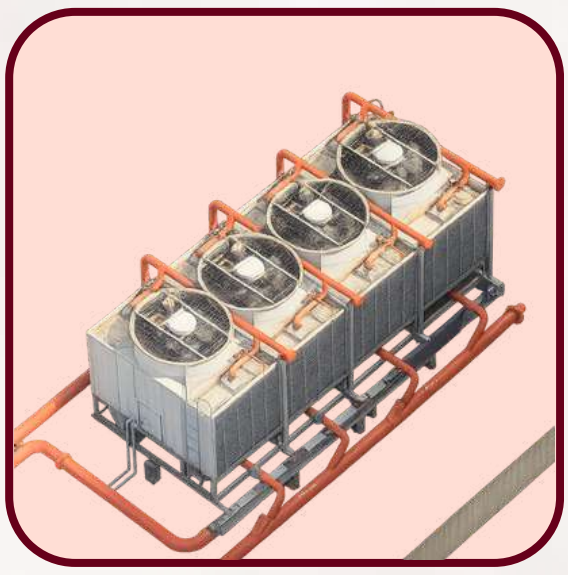
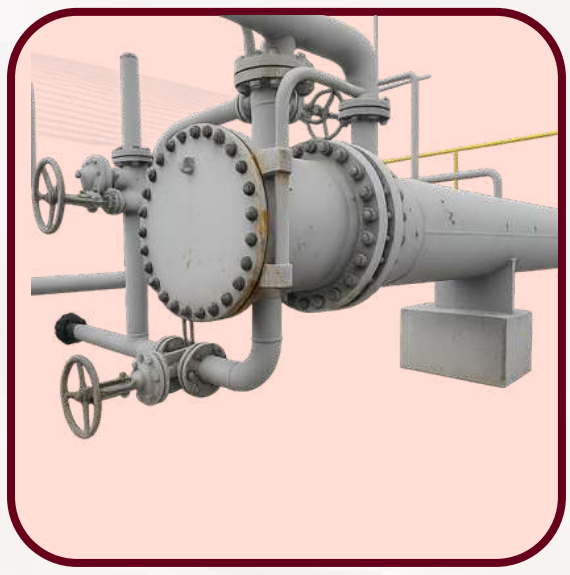
Our Other Courses

THERMAL DESIGN



AIR-COOLED HEAT EXCHANGER (ACHE)



SHELL & TUBE HEAT EXCHANGER (STHE)

THERMAL DESIGN COMBO (STHE & ACHE)

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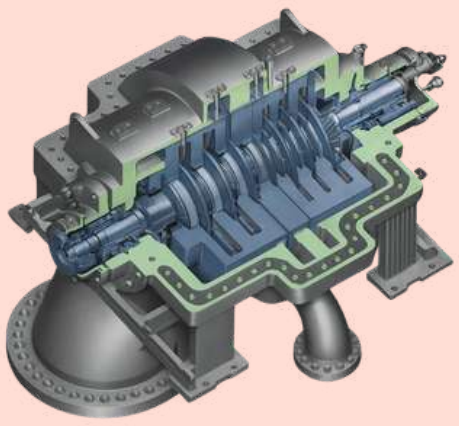
Our Other Courses

ROTARY EQUIPMENT DESIGN



CENTRIFUGAL COMPRESSOR

CENTRIFUGAL PUMPS IN OIL & GAS INDUSTRY

ROTARY EQUIPMENT DESIGN COMBO

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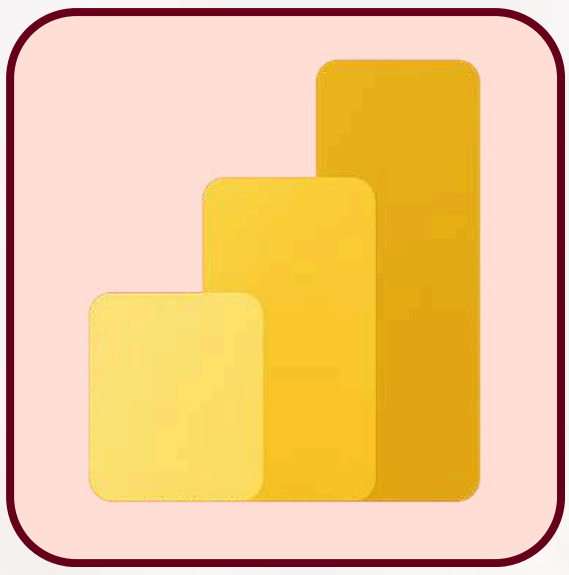
Our Other Courses

OTHER COURSES

MS EXCEL



POWER BI

GD&T (BASIC)

GD&T (ADVANCE)

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training@express-engg.com

PUNE

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Survey No - 43/1-9, Behind Girija Hotel, DP Road, Near Rajaram Bridge, Karvenagar, Pune - 411 052

SURAT

348, Green Palladia, Opposite Raj World,
Near Gaurav Path Road, Palanpore,
Surat, Gujarat - 395009

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