

'a School of Industry Oriented  
Engineering & Solutions'

OFFERS PROGRAM AVAILABLE IN OFFLINE  
AND ONLINE MODES

# CORE DESIGN ENGINEERING

a unique 350+ Hrs (Online)/450+ Hrs (Offline) Certified Practical Course in 'Design Engineering' structured as per Global Industry Standards with Hands-On Sessions and suites the requirement of Graduates & Working Professionals.



**DURATION: 12 WEEKS**

**RECOMMENDED FOR:**

Working Professionals, Graduates and Students  
[BE, M Tech & MS] of Aerospace & Mechanical Streams



# MENTORING PROCESS

01

## CONCEPTS

Build Concepts with Strong Fundamentals

## DESIGN THINKING

Safe Design to Advanced Light Weight Structures

02

03

## APPLICATIVE ENGINEERING

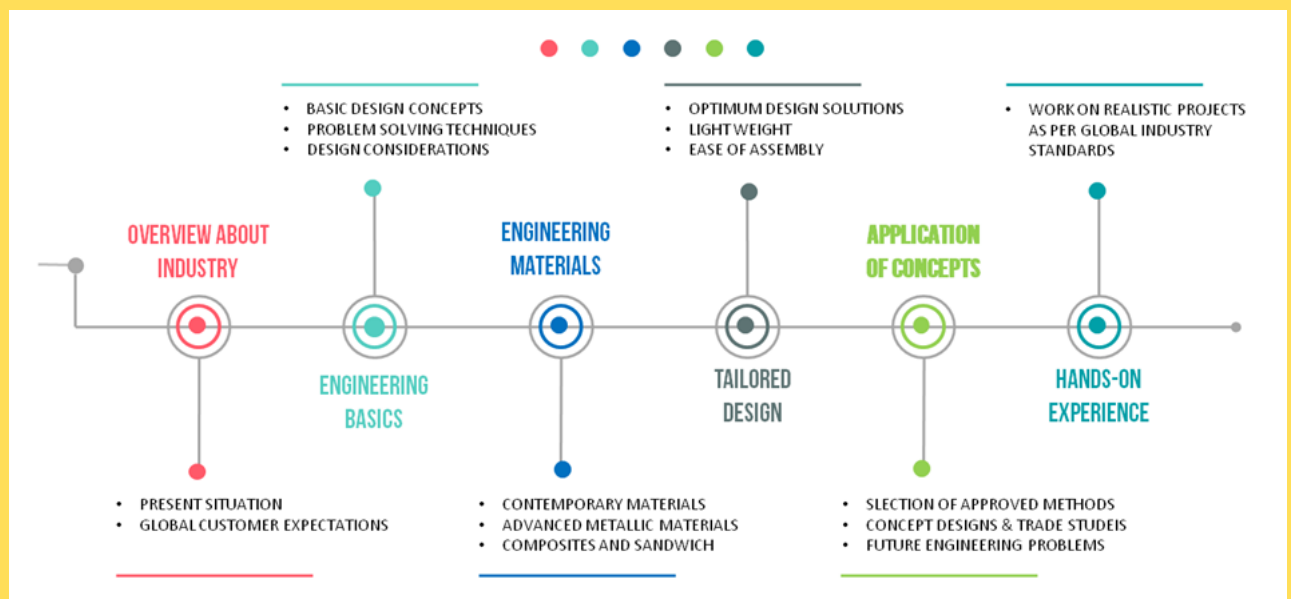
Concept to Real World Problems

## HANDS-ON

Experience as Per Global Industry Standards

04

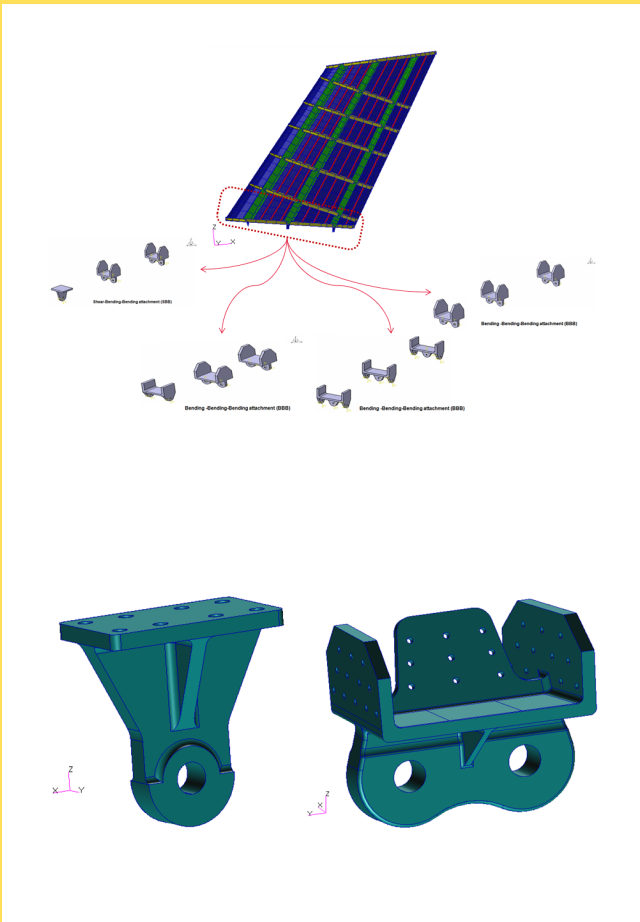
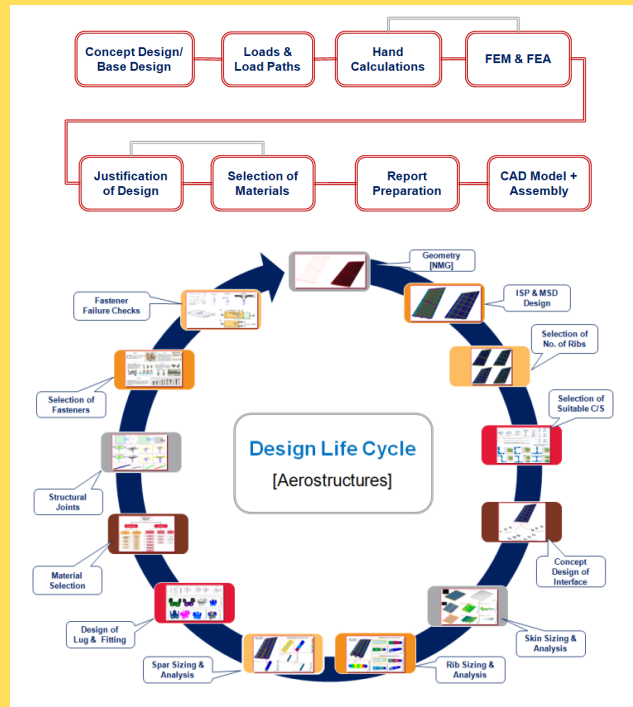
### ENGINEERING FUNDAMENTALS --> INDUSTRY PROBLEMS



# COURSE CONTENT

## 01 GENERAL TOPICS

- Factors Driving Engineering Industry
- Product Development Cycle & Design Life Cycle
- Role of Advanced Materials in Present & Future Engineering Applications
- Role of Engineering Knowledge in Long-Term Employment
- Roles & Responsibilities of an Engineer
- Global Customer Requirements & Expectations
- Resume Building & Interview Preparation Techniques



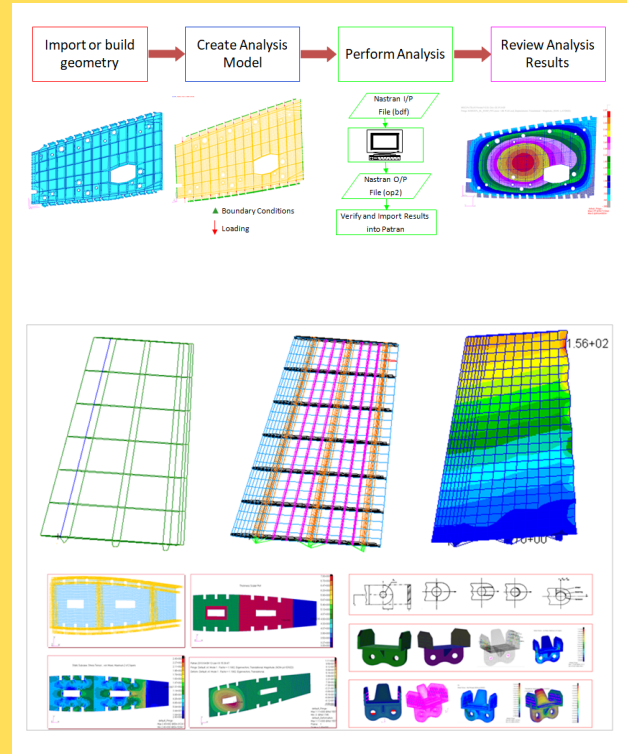
## 02 ENGINEERING DESIGN

- Design and Validation of Structural Beam & Industrial Frame Structure
- Selection of Suitable Cross-Sections Based on the Design Requirements
- Design Methodology & Considerations of Primary & Secondary Structures
- Concept study and Design of Semi-monocoque Structures
- Concept Design & Detail Design, Structural Configurations, Structural Joints Concepts
- Sheet Metal & Machined Component Design Criteria
- Conceptual Design of Vertical Tail to Rear Fuselage Interface
- MBD and GD&T Concepts

# COURSE CONTENT

## 03 ENGINEERING ANALYSIS

- Role of FEM & FEA in Aerospace & Mechanical Engineering Domain
- Structural Idealisation Techniques
- Model check and Model Verification Techniques
- Validation of FEM as per Global Industry Standards
- Deep insight about 1D, 2D & 3D analysis with meaningful examples
- Hands-on Experience on Linear Static & Buckling Analysis
- Analysis of Structures using Metallic & Composite Materials
- Local Analysis with Cut-outs & Reinforcements
- DFEM & Sub-modelling Techniques
- Sizing and analysis techniques as per global industry requirements



## 04 HAND CALCULATIONS

- Computation of Section Properties in Structured Approach
- Significance of SFD, BMD and Free-Body Diagrams
- Computation of Equilibrium Forces & Moments
- Computation of Different Types of Stresses
- Sizing and Verification of Secondary Brackets
- Design & Analysis Approach of Industrial Frame Structure
- Sizing of Lug using ESDU procedure & Design of Interface Fitting from Concept to Detail Design Phase
- Bolt Group Analysis & Estimation of Bolt Forces
- Selection of Fasteners & Fastener Failure Checks
- Sizing Analysis of Short & Long Columns
- Sizing Flat & Curved Panels for Different Edge Conditions
- Bolt Group Analysis & Fastener Checks
- Approved Global Engineering Methods like Michael NIU, Bruhn, ESDU, Roark, MMPDS etc.

$$\sigma_{@C} = \left\{ \left( \frac{M_x}{I_x} \cdot z \right) \cdot -1 \right\} + \left\{ \left( \frac{M_y}{I_y} \cdot y \right) \cdot -1 \right\}$$

$$\sigma_{@C} = \left\{ \left( \frac{300000}{13354.17} \cdot 12.5 \right) \cdot -1 \right\} + \left\{ \left( \frac{-1240000}{136364.7} \cdot 27.17 \right) \cdot -1 \right\}$$

$$\sigma_{@C} = [-280.81] + [247.06]$$

$$\sigma_{@C} = -33.7 \text{ N/mm}^2$$
  

$$\sigma_{@D} = \left\{ \left( \frac{M_x}{I_x} \cdot z \right) \cdot +1 \right\} + \left\{ \left( \frac{M_y}{I_y} \cdot y \right) \cdot +1 \right\}$$

$$\sigma_{@D} = \left\{ \left( \frac{300000}{13354.17} \cdot 15 \right) \cdot -1 \right\} + \left\{ \left( \frac{-1240000}{136364.7} \cdot 22.83 \right) \cdot +1 \right\}$$

$$\sigma_{@D} = [-336.97] + [-207.60]$$

$$\sigma_{@D} = -544.6 \text{ N/mm}^2$$
  

$$\sigma_{@E} = \left\{ \left( \frac{M_x}{I_x} \cdot z \right) \cdot +1 \right\} + \left\{ \left( \frac{M_y}{I_y} \cdot y \right) \cdot +1 \right\}$$

$$\sigma_{@E} = \left\{ \left( \frac{300000}{13354.17} \cdot 15 \right) \cdot +1 \right\} + \left\{ \left( \frac{-1240000}{136364.7} \cdot 22.83 \right) \cdot +1 \right\}$$

$$\sigma_{@E} = [336.97] + [-207.60]$$

$$\sigma_{@E} = 129.4 \text{ N/mm}^2$$

$$\sigma_{@F} = \left\{ \left( \frac{M_x}{I_x} \cdot z \right) \cdot +1 \right\} + \left\{ \left( \frac{M_y}{I_y} \cdot y \right) \cdot -1 \right\}$$

$$\sigma_{@F} = \left\{ \left( \frac{300000}{13354.17} \cdot 12.5 \right) \cdot +1 \right\} + \left\{ \left( \frac{-1240000}{136364.7} \cdot 27.17 \right) \cdot -1 \right\}$$

$$\sigma_{@F} = [280.81] + [247.06]$$

$$\sigma_{@F} = 527.9 \text{ N/mm}^2$$

**Resolving Forces**

$$F_x' = F_x \cos 8.31^\circ$$

$$F_y' = F_x \sin 8.31^\circ$$
  

$$F_x' = 1226.25 \text{ N}$$

$$F_y' = 2011.05 \text{ N}$$

**Resolving Moments**

$$M_x' = M_x \cos 8.31^\circ$$

$$M_y' = M_x \sin 8.31^\circ$$
  

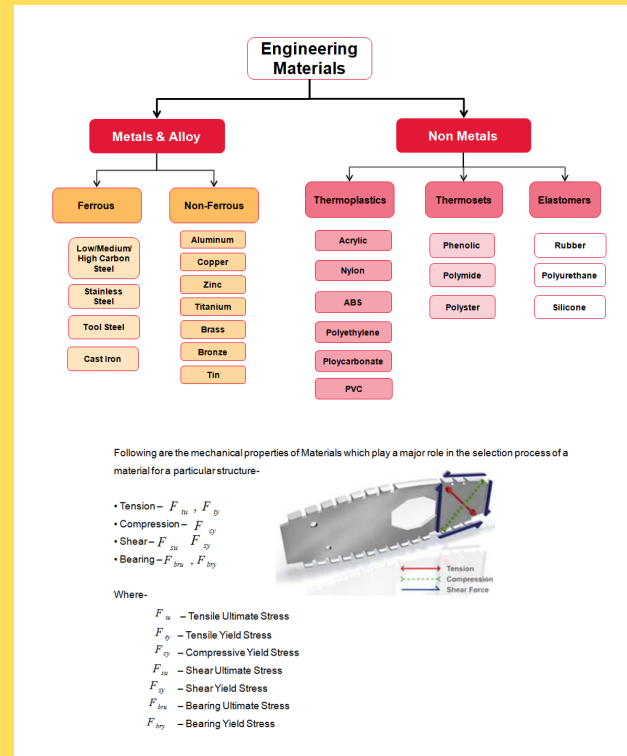
$$M_x' = 99955.07 \text{ N-mm}$$

$$M_y' = 18513.92 \text{ N-mm}$$

# COURSE CONTENT

## 05 METALLIC MATERIALS

- Introduction to Ferrous & Non-Ferrous Alloys
- Detail Study of Non-Ferrous Alloys
- Next Gen. Aluminum Alloys & Their Benefits
- Material Selection Criteria as per FAR Guidelines
- Selection of Material Allowable
- Study of Different Forms of Materials
- Form of Materials & Material Failure Theories



## 06 COMPOSITE MATERIALS

- Introduction to Composite Materials
- Mechanical Properties of Composites & its Benefits
- Stacking Sequence Formation Guidelines as per Global Industry Standards
- Verifying Compliance with Guidelines
- Sizing of Composite Flat Panels
- Simulation of Composite Structures
- Composite Ply Drop Techniques
- Technical Challenges & Concerns of Composite Materials
- Design Considerations of Composite Structures
- Composite Failure Modes & Failure Theories
- Introduction to Manufacturing Methods of Composite Structures

Figure 4.4 Effect of applying a fiber to a composite material and properties.

Figure 4.5 Variation of strength with angle of applied force.

Figure 7: Equilibrium difference between skin and resin matrix. Balancing requirement for balanced ply layups around the Neutral axis.

# FREQUENTLY ASKED QUESTIONS

**Q: I am really interested to build career in Design domain. However, my CGPA/Aggregate is not good (<8.0). Is my academic performance going to affect my career chances?**

A: The recent trends suggest that Engineering domain in our nation has been witnessing a significant shift in hiring approach where, who you are (relevant knowledge & appropriate skills) matters more than what your marks are. Even with lower CGPA, if you have strong profile/resume, you have much better chances of hiring by the companies for the core engineering jobs.

**Q: What does strong profile/resume mean?**

A: A strong profile is one where the candidate is able to display the knowledge gained during his academic pursuit and which is solidified by good internships and good projects in the area of his/her field of interest.

**Q: What do you mean by long term career/employment?**

A: Long-term career/employment means, the Engineer is able to sustain his/her job in their organization/domain, or able to shift domains with ease during tough times in their career/ job market for long-term at least up to 50+ years. It's been witnessed that, professionals who are just having experience on software tools are finding difficult to sustain long-term employment and are in the threat of losing their jobs at the age of 30-35.

**Q: I wish to pursue Masters abroad in Aerospace/Mechanical domain. How is the course beneficial for me?**

A: The long-term program 'Core Design Engineering' contains a vast range of topics and subjects which are essential for someone who wishes to become a real-time design engineer. With this Point-of-View, the course shall aid the participants in building a strong profile which displays the right knowledge and skill-sets of the candidates, along with relevant industry standard projects. A strong profile always helps in landing admission at a reputed university and opt for the right internships during Master studies.

**Q: The course content/examples seem to be oriented more towards Aerospace Industry. Any specific reason?**

A: Aerospace Industry is one of the very few Industries where the best Engineering methodologies and practices exist. When a participant has exposure with the best engineering, he/she shall be confident to apply for jobs in related domains in Design Engineering like Automobile, Rail, and Heavy Engineering etc.

**Q: I am an Engineering recent graduate. Will I be able to follow and understand the content of the program during the course period?**

A: The course structure has been framed by our team of Industry Experts from different verticals of Design background, who have put forward the best learnings during their professional career into this mentorship program. The program follows a unique methodology of transforming a Fresher to a Beginner. This methodology ensures the program participants are able to grasp the technical content and become confident to defend their learnings during brainstorming sessions of the program.

# PROGRAM TAKEAWAYS

- Primary focus on Engineering Concepts considering the Physics of the problems and Real-time simulation techniques.
- Program focuses not just on employment based skills; also provides relevant core engineering knowledge which ensures participants stand unique with increased confidence, and thus enable to sustain long-term employment.
- Make participants seek employment in Engineering Serious Companies such as Captive Centers, MNCs, MROs, R & D centers, Design Organizations and Start-Ups.
- Mentoring as per Global Industry Requirements & Standards.
- Highest emphasis on understanding concepts rather than just learning few theories.
- Interactive sessions encourages for proactive discussions from participants which enhances their self confidence to face technical interviews.
- Get clear understanding on how to approach for Higher Studies in technical domain.
- Gain insights on job requirements in OEMs and Core Engineering Industry.
- Knowledge and hands-on experience helps to work for long-term and makes them stand out from the general crowd of competitors.
- *Program is highly recommended for the students, graduates and working professionals who wish to pursue Masters in Abroad Universities OR who has an ambition to work in Core Engineering Domain and has passion to contribute to Engineering Community.*

# For More Information & Registration

## CONTACT US @

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## WANT TO KNOW MORE ABOUT US???

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**Website:** *www.industry-oriented-engineering.com*

**YouTube:** *a School of Industry Oriented Engineering*

**Instagram:** *industry\_oriented\_engineering*

**Facebook:** *A School of Industry Oriented Engineering*

