Event Report: Faculty Development Program on "MATLAB for Engineering Mechanics"

Dates Conducted: January 29th & 30th, 2026

Coordinators: Dr. Syed Shaul Hameed and Dr. Pradeep Kumar D.

Venue: CAD Laboratory / Dassault Systemes Centre of Excellence

1. Overview of the Faculty Development Program

The two-day Faculty Development Program (FDP), titled **"MATLAB for Engineering Mechanics"**, took place on the 29th and 30th of January, 2026. This programme was organised under the able coordination of Dr. Syed Shaul Hameed and Dr. Pradeep Kumar D. Its primary objective was to empower faculty members teaching engineering mechanics with key computational skills, focusing on the application of MATLAB for both problem-solving and visualisation within this domain.

The FDP adopted a blended learning approach, integrating self-paced online modules from MATLAB Academy with rigorous, instructor-led, hands-on sessions. Through this structure, participants not only gained theoretical knowledge via online resources but also engaged in practical exercises designed to reinforce their understanding and build proficiency in MATLAB-based solutions for engineering mechanics problems.

2. Schedule of Events

B.S. Abdur Rahman ®
Crescent
Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

Department of Mechanical Engineering

FACULTY DEVELOPMENT PROGRAM

MATLAB for Engineering Mechanics

📅 29 & 30 Jan 2026   🕘 9 AM 4 PM   📍 CAD LAB, MS Block, 4th Floor, BSACIST

Convener

Dr. H. Siddhi Jailani
Professor & Dean SMS

Dr. V. Muralidharan
Assoc. Professor & HOD Mechanical

Organisers

Dr. Syed Shaul Hameed, A. P. Sr. Gr.
Dr. Pradeep Kumar D, A. P. Sr. Gr.

Event Schedule

Date	Session	Time	Topic / Activity
Jan 29, 2026	Day 1 - Morning (Session 1)	9:30 to 10:30 AM	Inauguration & Guided MATLAB Account Creation
Jan 29, 2026	Day 1 - Morning (Session 2)	11:00 to 12:30 PM	MATLAB On-ramp Course Completion
Jan 29, 2026	Day 1 - Afternoon (Session 1)	1:30 PM to 2:30 PM	Hands-on: Resolution of Forces
Jan 29, 2026	Day 1 - Afternoon (Session 2)	3:00 PM to 4:10 PM	Hands-on: Resultant of coplanar concurrent force systems & vector visualization
Jan 30, 2026	Day 2 - Morning (Sessions 1 & 2)	9:30 AM to 12:30 PM	"Introduction to Symbolic Math Toolbox" course (MATLAB Academy)
Jan 30, 2026	Day 2 - Afternoon	1:30 PM to 4:10 PM	Hands-on: Supports and Reactions of beams & Closing ceremony

3. Detailed Description of Proceedings

Day 1: January 29, 2026 – Foundations and Force Resolution

The FDP commenced with an introductory morning session focused on establishing the foundational tools required for the program.

- **Morning Sessions:** Faculty members were first guided step-by-step through the process of creating their official MATLAB accounts. Following this, the second session was dedicated to completing the **MATLAB On-ramp course**. This ensured that all participants, regardless of their prior experience, acquired a baseline understanding of the MATLAB environment, syntax, and fundamental operations.

- **Afternoon Sessions:** The afternoon transitioned into applied engineering mechanics. In the first session, participants engaged in hands-on problem-solving related to the **"resolution of forces."** The final session of the day advanced to calculating the **"Resultant of coplanar concurrent force systems."** A key highlight of this session was teaching the faculty how to programmatically visualize resultant and force vectors, bridging the gap between mathematical computation and graphical interpretation.
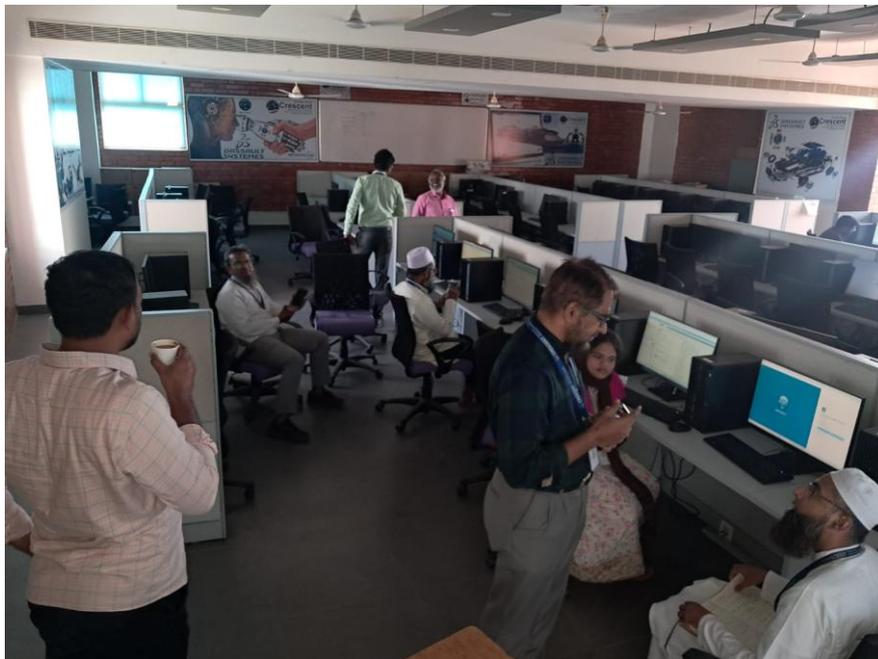

Figure 1: *Faculty members actively participating in the hands-on lab sessions at the Dassault Systems Centre of Excellence, engaging in collaborative learning and problem-solving.*

Day 2: January 30, 2026 – Symbolic Math and Beam Reactions

The second day shifted focus toward advanced mathematical modelling and structural analysis using MATLAB's specialized toolboxes.

- **Morning Sessions:** The entire morning was dedicated to mastering symbolic computation. Faculty members were guided through the **"Introduction to Symbolic Math Toolbox"** course via the MATLAB Academy. This allowed participants to learn how to perform analytical mathematics, define symbolic variables, and solve algebraic equations analytically rather than purely numerically.

- **Afternoon Sessions:** In the concluding afternoon session, the newly acquired symbolic math skills were put to practical use. Participants tackled complex, hands-on problems calculating the **Supports and Reactions of beams**. Utilizing the interactive flat panel, the instructors demonstrated how to set up equilibrium equations (e.g., using syms to define variables like F_A and F_B) and extract decimal approximations for the reactions.
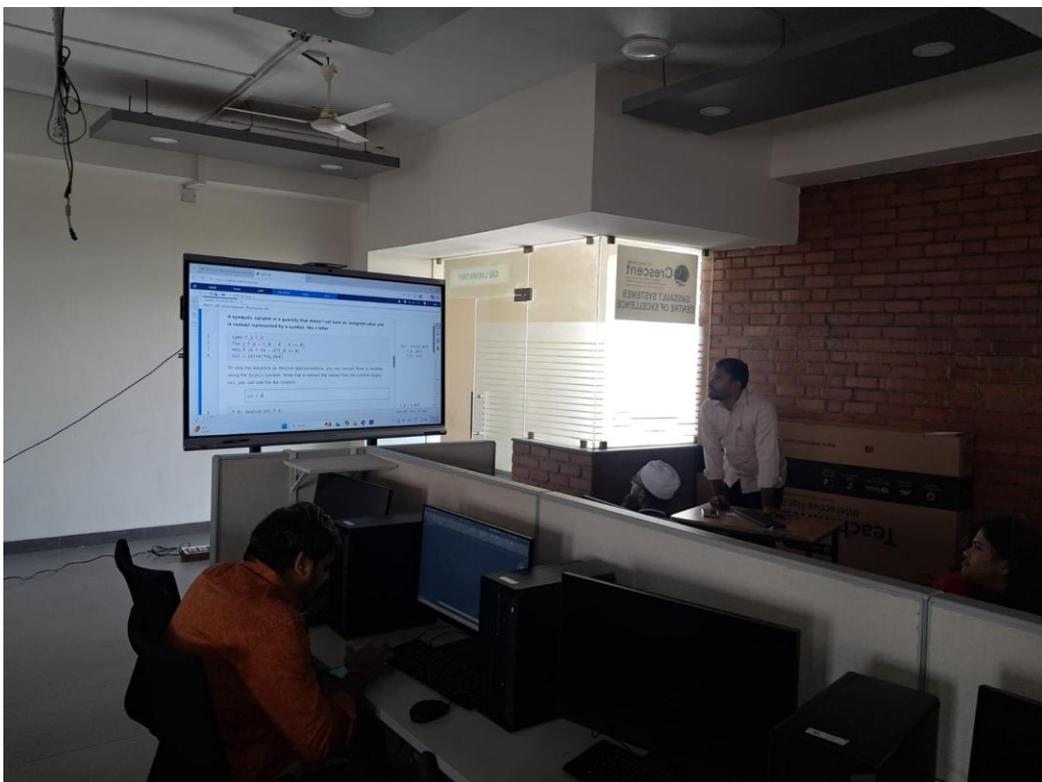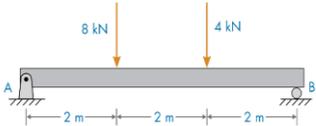

Figure 2: *Instructor demonstrating the use of the Symbolic Math Toolbox on the interactive flat panel during the Day 2 session on beam supports and reactions.*

4. Conclusion

The two-day FDP successfully achieved its objective of integrating modern computational tools into the teaching and problem-solving methodologies of Engineering Mechanics. Under the guidance of Dr. Syed Shaul Hameed and Dr. Pradeep Kumar D., the faculty members gained practical, hands-on experience with both numerical and symbolic capabilities in MATLAB, empowering them to deliver more interactive and technologically advanced mechanics courses to their students.

Snapshots of the Problems Solved.

Coplanar Concurrent Force System

Write a MATLAB program to <u>determine the magnitude and direction of the resultant of 3 coplanar forces</u> applied at point A in Figure.

Example ES7.1: Write a MATLAB program to determine the magnitude and direction of the resultant of 3-coplanar forces applied at point A in Fig. ES7.1. Use the following values:

$$F_1 = 20 \text{ kN}, \quad F_2 = 40 \text{ kN}, \quad F_3 = 200 \text{ kN}, \quad \alpha_1 = 40°, \quad \alpha_2 = 25° \text{ and } \alpha_3 = 58°.$$
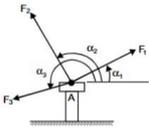
Solve for Support Reactions

There are two main steps required to solve for the support reactions of a loaded beam using the Symbolic Math Toolbox.

1. Draw the free-body diagram and set up the equilibrium equations.
2. Define and solve the symbolic equations in MATLAB.

Example 1. Solve for the support reactions of the beam illustrated below.