



SEEL ∞
Simulation Enabled Experiential Learning

Two-Day Certification Program

Battery Design, Analysis and Simulation using COMSOL Multiphysics

Venue: Dayananda Sagar Academy of Technology and Management (DSATM), Bengaluru

Date: 31st August & 1st September 2026

Organized By: VTU SEEL – Simulation Enabled Experiential Learning (SEEL)

Event Report

Organised By

VTU SEEL (Simulation Enabled Experiential Learning)

VTU e-Learning Centre, Mysuru

Visvesvaraya Technological University (VTU)

Hosted By



Dayananda Sagar

Academy of Technology and Management

Powered By



RFN : 2026-2027/01



Program Overview

Program Title	Battery Design, Analysis and Simulation using COMSOL Multiphysics
Venue	Dayananda Sagar Academy of Technology and Management (DSATM), Bengaluru
Date	31st August & 1st September 2026
Duration	Two Days
Organised By	VTU SEEL – Simulation Enabled Experiential Learning
Mode	Offline / Hands-on Certification Program

Objectives of the Program

- > To provide participants with practical exposure to battery design, analysis and simulation.
- > To introduce participants to COMSOL Multiphysics and relevant modelling workflows.
- > To develop hands-on skills through demonstrations and simulation exercises.
- > To facilitate technical interaction, doubt clarification and application-oriented learning.
- > To provide certification to eligible participants who successfully completed the program requirements.



CERTIFICATION COURSE ON

BATTERY DESIGN, MODELING, ANALYSIS & SIMULATION

using COMSOL Multiphysics®

Learn to design, model, analyze, and optimize advanced battery systems using COMSOL Multiphysics®. Gain hands-on skills to solve real-world electrochemical, thermal, and structural challenges.



Industry-Recognized
Certification



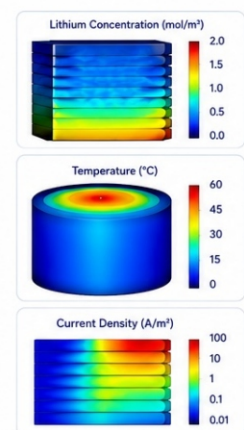
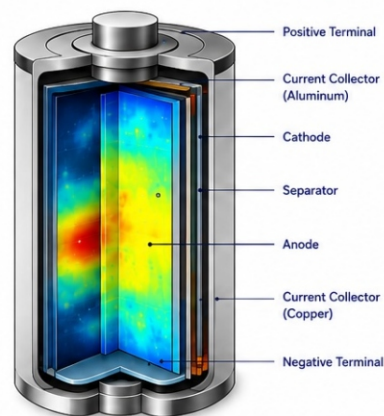
Hands-on Simulations
with COMSOL



Real-World Battery
Applications



Expert-Led
Training



COURSE HIGHLIGHTS

- Electrochemical modeling of batteries
- Thermal analysis and management
- Transport phenomena in porous media
- Structural analysis and degradation
- Battery Pack modeling & BMS insights
- Parameter estimation & optimization
- Hands-on projects & case studies

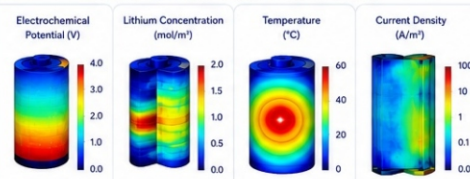
KEY TOPICS COVERED

- Lithium-ion Batteries
- Solid-State Batteries
- Battery Packs & Modules
- Thermal Management
- Battery Safety & Reliability
- Fast-Charging Analysis

LEARN THROUGH CASE STUDIES

- Battery Cell Performance
- Thermal Runaway Analysis
- Battery Pack Design
- Degradation & Lifetime Prediction

MULTIPHYSICS SIMULATIONS YOU WILL MASTER



WHO SHOULD ATTEND?

- Battery Engineers
- R&D Professionals
- Researchers
- Students & Academics



Communication & Co-ordination Timeline

Sl. No.	Date	Activity	Communication / Action	Status
1	13.08.2026	Initial Proposal	Program proposal/invitation sent to DSATM.	Completed
2	15.08.2026	Follow-up	Follow up with the college coordinator regarding confirmation.	Completed
3	19.08.2026	Program Confirmation	Venue, dates and coordination details confirmed.	Completed
4	21.08.2026	Registration	Registration link/details circulated to participants.	Completed
5	28.08.2026	Infrastructure Confirmation	Lab/computer, internet and other arrangements confirmed.	Completed
6	29.08.2026	Final Coordination	Final participant list, schedule and event requirements verified.	Completed

Registration Details

Particulars	Details
Total Number of Registered Participants	164
Day 1 Participants	37
Day 2 Participants	37
Participants Eligible for Certification	37
Certificate Issued	Yes, Physical Form of Certificate Issued

Day 1 : Activities

The first day focused on introducing participants to battery modelling concepts and COMSOL Multiphysics, followed by demonstrations and hands-on activities.

Major Activities

- Registration and participant check-in.
- Welcome and introduction to the certification program.
- Introduction to COMSOL Multiphysics.
- Introduction to battery design, analysis and simulation.
- Technical demonstration and modelling workflow.
- Hands-on simulation exercises.
- Participant interaction and doubt clarification.

Day 2 : Activities

The second day focused on advanced practical activities, simulation analysis, participant interaction, assessment/eligibility requirements and completion of the certification process.



Major Activities

- Recap of Day 1.
- Advanced battery modelling and simulation activities.
- Hands-on practical exercises.
- Simulation results and analysis.
- Technical interaction and doubt clarification.
- Assessment/skill test, wherever applicable.
- Feedback collection.
- Certificate distribution / certificate process.

Syllabus Covered

Course Objective : Upon successful completion of this course, participants will be able to:

- Understand battery technologies and electrochemical principles.
- Model lithium-ion batteries using COMSOL Multiphysics.
- Analyze battery performance under different operating conditions.
- Simulate charge-discharge behavior and thermal effects.
- Evaluate battery degradation mechanisms. Optimize battery designs for improved performance and safety.

Modules & Sessions

Module 1: Fundamentals of Batteries and Electrochemical Systems (4 Hours)

Session 1: Introduction to Battery Technologies

- Overview of Energy Storage Systems
- Battery Types and Applications
- Lithium-Ion Battery Fundamentals
- Battery Components
 - Cathode
 - Anode
 - Electrolyte
 - Separator
 - Current Collectors
- Battery Performance Metrics
 - Capacity
 - Energy Density
 - Power Density
 - C-rate
 - State of Charge (SOC)
 - State of Health (SOH)

Session 2: Electrochemical Modeling Fundamentals

- Electrochemical Reactions
- Mass Transport Mechanisms
- Charge Transfer Kinetics
- Diffusion and Migration
- Governing Equations for Battery Systems
- Introduction to Physics-Based Battery Models

Practical Session

- Introduction to COMSOL Multiphysics Environment
- Battery Design Module Overview
- Geometry Creation and Material Assignment
- Solver Configuration



Module 2: Lithium-Ion Battery Modeling (4 Hours)

Session 3: Battery Cell Design and Modeling

- Cell Architectures
- Cylindrical Cells
- Pouch Cells
- Prismatic Cells
- Single Particle Model
- Porous Electrode Theory
- Newman Battery Model Concepts

Practical Exercise 1: Simulation of a 1D Lithium-Ion Battery Cell

- Cell Geometry Setup
- Material Property Definition
- Electrode Configuration
- Initial Conditions Setup

Session 4: Charge-Discharge Performance Analysis

- Voltage Profiles
- Capacity Estimation
- Rate Capability Analysis
- Internal Resistance Effects

Practical Exercise 2: Charge-Discharge Simulation

- Constant Current Charging
- Constant Current Discharging
- SOC Analysis
- Voltage Response Evaluation

Module 3: Thermal and Safety Analysis (4 Hours)

Session 5: Battery Thermal Management

- Heat Generation Mechanisms
- Thermal Runaway Basics
- Cooling Strategies
- Battery Thermal Management Systems

Practical Exercise 3 : Thermal Analysis of Lithium-Ion Cell

- Electrochemical-Thermal Coupling
- Heat Source Definition
- Temperature Distribution Analysis
- Hot Spot Identification

Session 6 : Battery Safety and Reliability

- Thermal Runaway Phenomena
- Aging and Degradation Mechanisms
- Mechanical Stress Effects
- Safety Standards Overview

Practical Exercise 4 : Safety Scenario Simulation

- High Current Operation
- Overcharge Conditions
- Thermal Stress Evaluation
- Safety Margin Assessment

Module 4: Battery Pack Design and Optimization (4 Hours)

Session 7: Battery Pack Modeling

- Cell-to-Pack Design
- Electrical Connections
- Series and Parallel Configurations
- Thermal Interactions in Packs

Practical Exercise 5: Battery Pack Simulation

- Multi-Cell Pack Modeling
- Temperature Uniformity Study
- Voltage Balancing Analysis
- Current Distribution Assessment

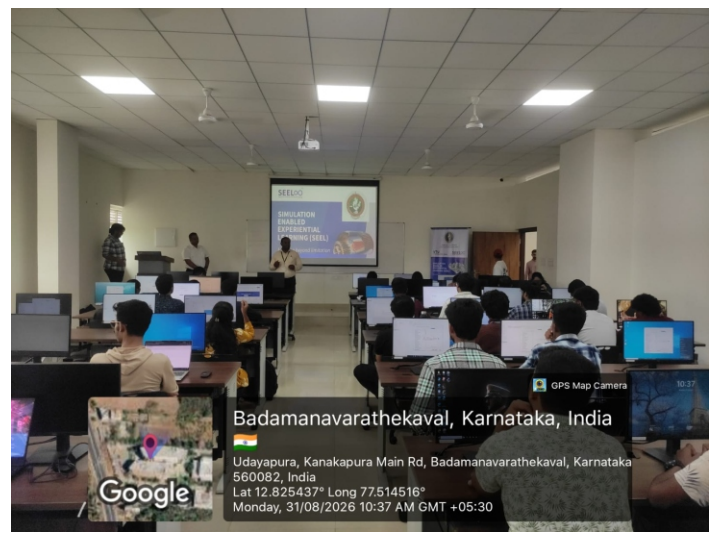
Session 8: Design Optimization and Final Project

- Design Parameters
- Sensitivity Analysis
- Optimization Techniques
- Performance Improvement Strategies

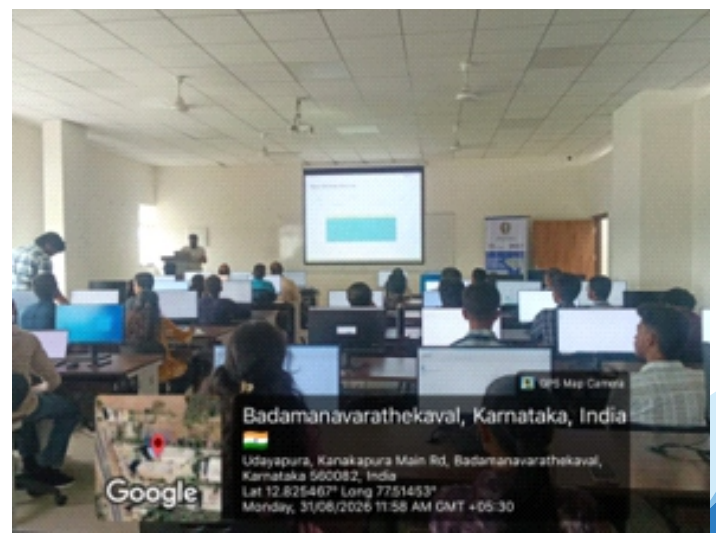


Event Photographs

Inauguration / Welcome

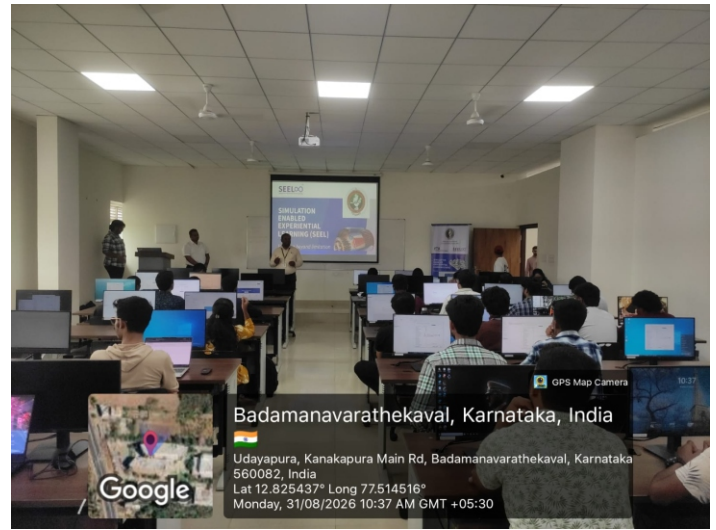
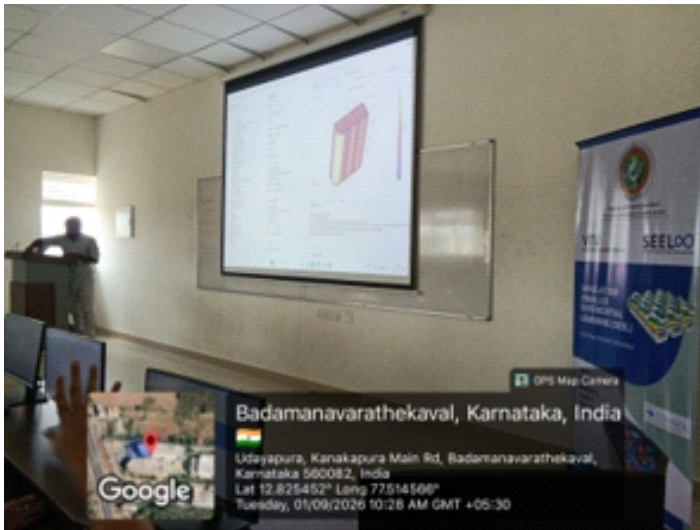


Technical Sessions

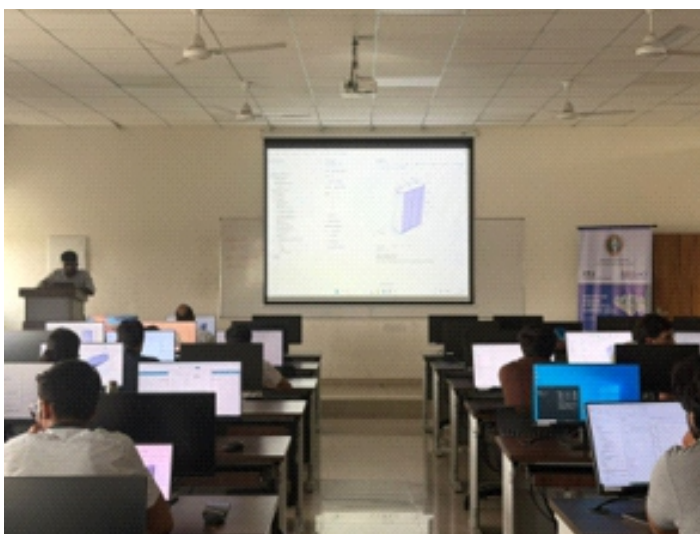
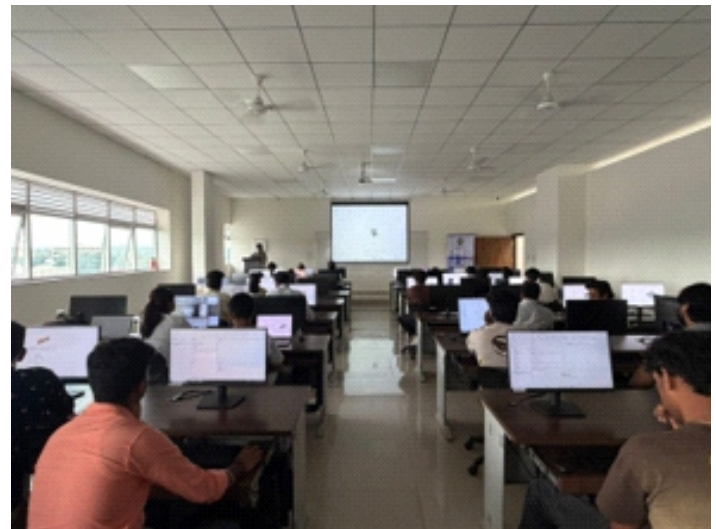




Event Photographs



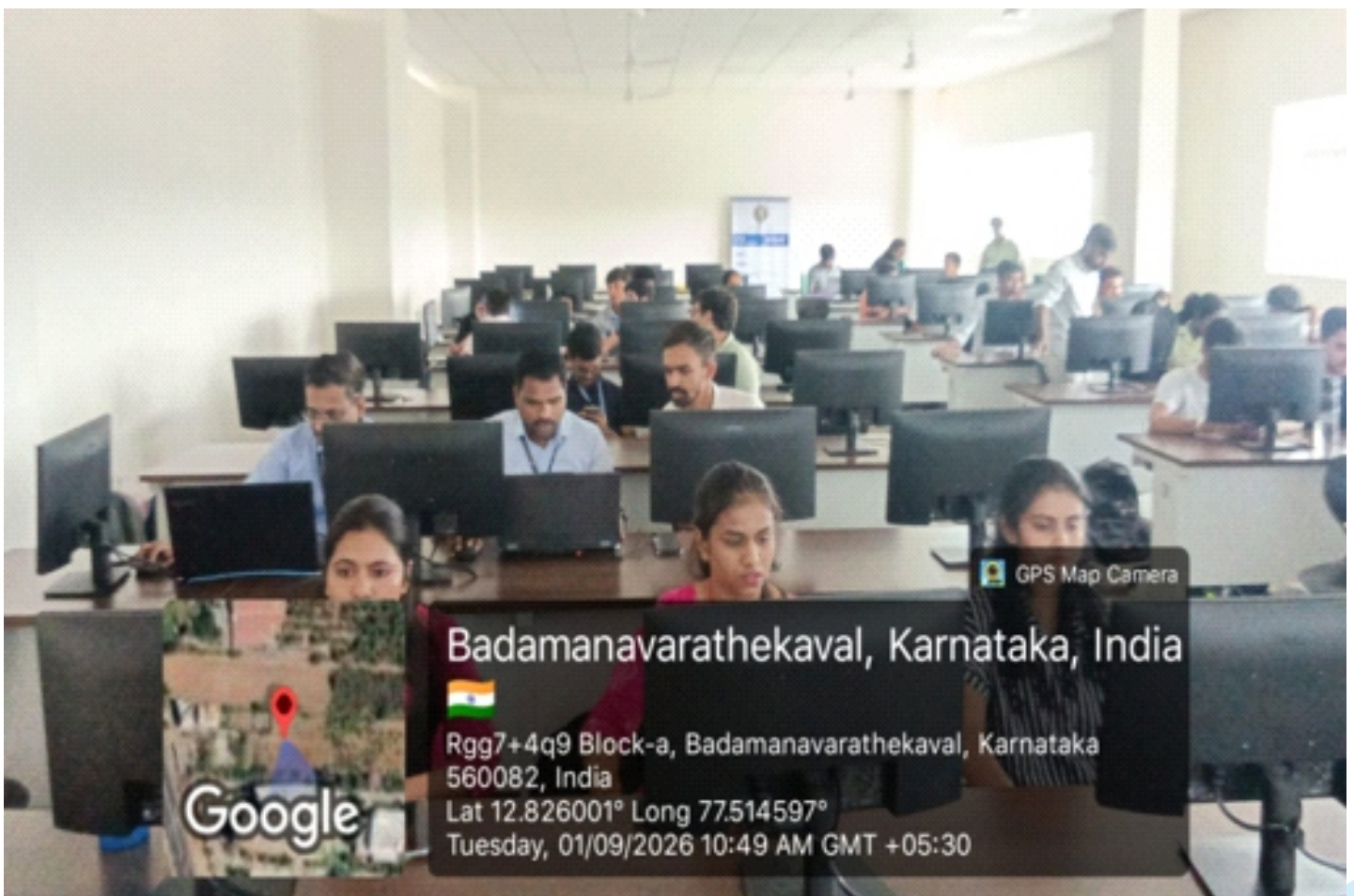
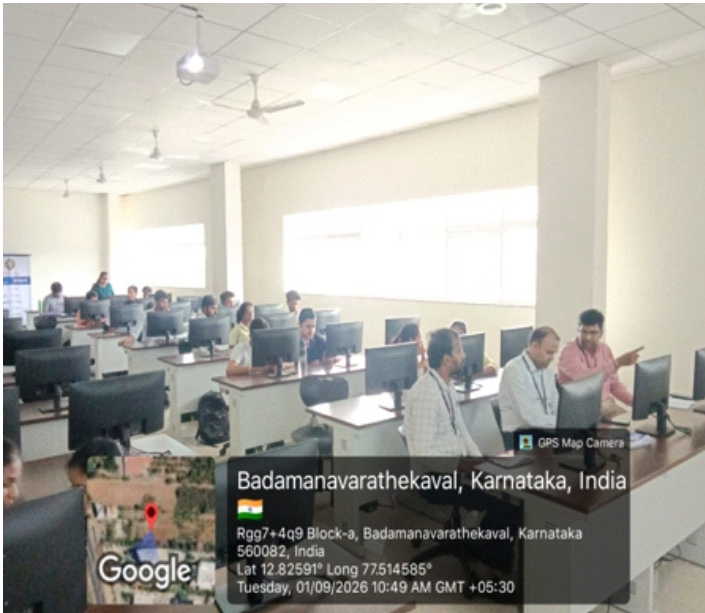
Hands-on Training





Event Photographs

Participant Interaction





Event Photographs

Certificate Distribution





Event Photographs

Group Photograph



Attendance Sheet

Sl. No.	Name	Roll No.	Signature	Signature	Signature
1	Abhishek A. S.	18BCE001			
2	Abhishek A. S.	18BCE002			
3	Abhishek A. S.	18BCE003			
4	Abhishek A. S.	18BCE004			
5	Abhishek A. S.	18BCE005			
6	Abhishek A. S.	18BCE006			
7	Abhishek A. S.	18BCE007			
8	Abhishek A. S.	18BCE008			
9	Abhishek A. S.	18BCE009			
10	Abhishek A. S.	18BCE010			
11	Abhishek A. S.	18BCE011			
12	Abhishek A. S.	18BCE012			
13	Abhishek A. S.	18BCE013			
14	Abhishek A. S.	18BCE014			
15	Abhishek A. S.	18BCE015			
16	Abhishek A. S.	18BCE016			
17	Abhishek A. S.	18BCE017			
18	Abhishek A. S.	18BCE018			
19	Abhishek A. S.	18BCE019			
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34	Abhishek A. S.	18BCE034			
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36	Abhishek A. S.	18BCE036			
37	Abhishek A. S.	18BCE037			
38	Abhishek A. S.	18BCE038			
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98	Abhishek A. S.	18BCE098			
99	Abhishek A. S.	18BCE099			
100	Abhishek A. S.	18BCE100			



**Hosting Team at
Dayananda Sagar Academy of Technology and Management (DSATM), Bengaluru**



Dr. M. Ravishankar, Principal



Dr. Santhosh N
Head of the Department
Department of Mechanical Engineering



Dr. Abhinav
SEEL Faculty Co-ordinator
Assistant Professor
Department of Mechanical Engineering

**Faculties and Staffs of
Department of Mechanical Engineering
Dayananda Sagar Academy of Technology and Management (DSATM), Bengaluru**





SEEL ∞
Simulation Enabled Experiential Learning

**SIMULATION ENABLED
EXPERIENTIAL LEARNING (SEEL)**
learning beyond limitation

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