ATAL Academy Sponsored

Two Weeks (Hybrid) Faculty Development Program

on

"Digital Twin for Electric Vehicles"

September 12 -17, 2022 (Online) & September 19 -23, 2022 (Offline)

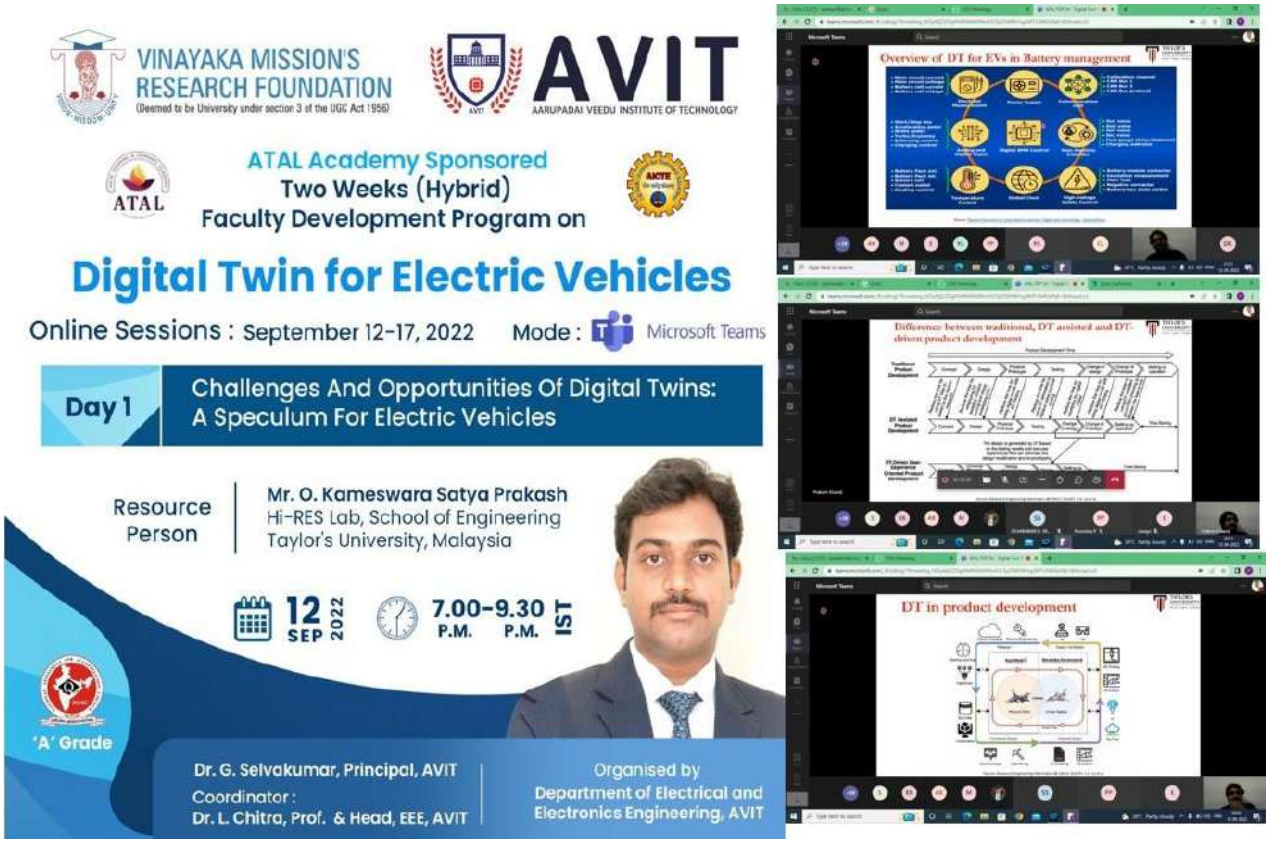
A two weeks (Hybrid Mode) Faculty Development Program on "Digital Twin for Electric Vehicles" was organized from 12th to 23rd September 2022 by Department of Electrical and Electronics Engineering in Association with ATAL.

Day – 1 : 12/09/2022

Topic: Challenges and Opportunities of Digital Twins: A Speculum for Electric Vehicles

The resource person for the ATAL FDP was Mr.O.Kameswara Satya Prakash, Hi-Res Lab, School of Engineering, Taylor's University, Malaysia. On 12th September at 7.00 PM , the program started with a Welcome address by Dr.L.Chitra, Coordinator of ATAL FDP and HoD / EEE. The Presidential address was delivered by Dr.G.Selvakumar , Principal of AVIT. The special address was given by Dr.L.Prabhu , Vice Principal (Admin) and Dr.D.Vijendra Babu , Vice Principal (Part time studies). Mr.S.Prakash Co-Coordinator of ATAL FDP and AP(Gr-II) / EEE briefed about the procedure and guidelines of the ATAL FDP. The introduction of the guest was given by Mrs. P.Poornima, AP(Gr-II)/EEE. The session was taken over by the Mr. O. Kameswara Satya Prakash. The topics covered by the resource person are as follows :

- About digital twin
- History of DT
- Conceptual DT
- DT's reference architecture
- DT's variations
- Maturity levels of DT
- Misconceptions of digital twin
- DT in product development
- Challenges
- Applications and opportunities
- Application of DT in EVs

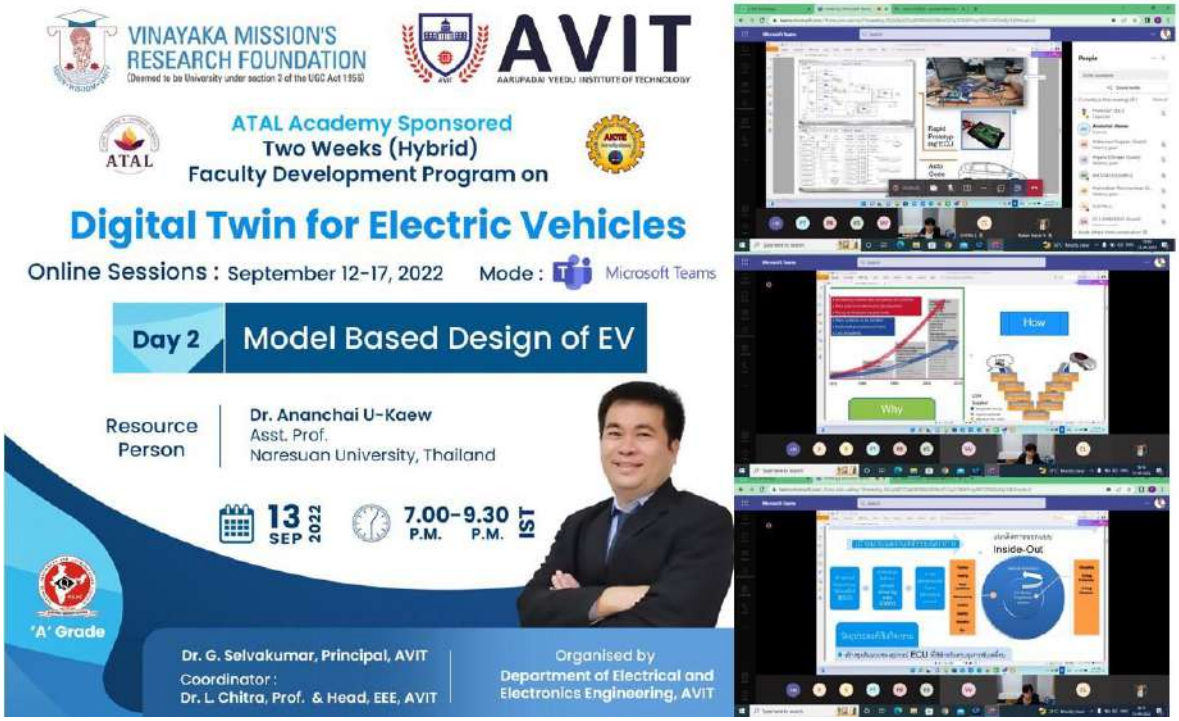


Day – 2 : 13/09/2022.

Topic: Model Based Design of EV

The second day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr.V.Rattankumar, AP(Gr-II) / EEE .The resource person for the ATAL FDP was Mr.Ananchai U-kaew, Development and Research of Innovative Vehicle Engineering (DRIVE) Center, Naresuan University, Thailand. Then thesession was taken over by the Mr. AnanchaiUkaew. The topics covered by the resource person are as follows :

- Drive-by-wire technology toward ISO 26262
- Development of Dynamic Controller of Motor Drive for Electric Vehicle
- Automotive Software Development
- Component sizing by means of EV system simulation
- Functional design model based design for design criteria
- Drive-by-wire for EV functional design and Conceptual ECU architecture design
- Rapid ECU prototyping Real-time Embedded system
- software function Model In-the-Loop Testing: MIL
- ECU In-the-Loop Testing: HIL Setup

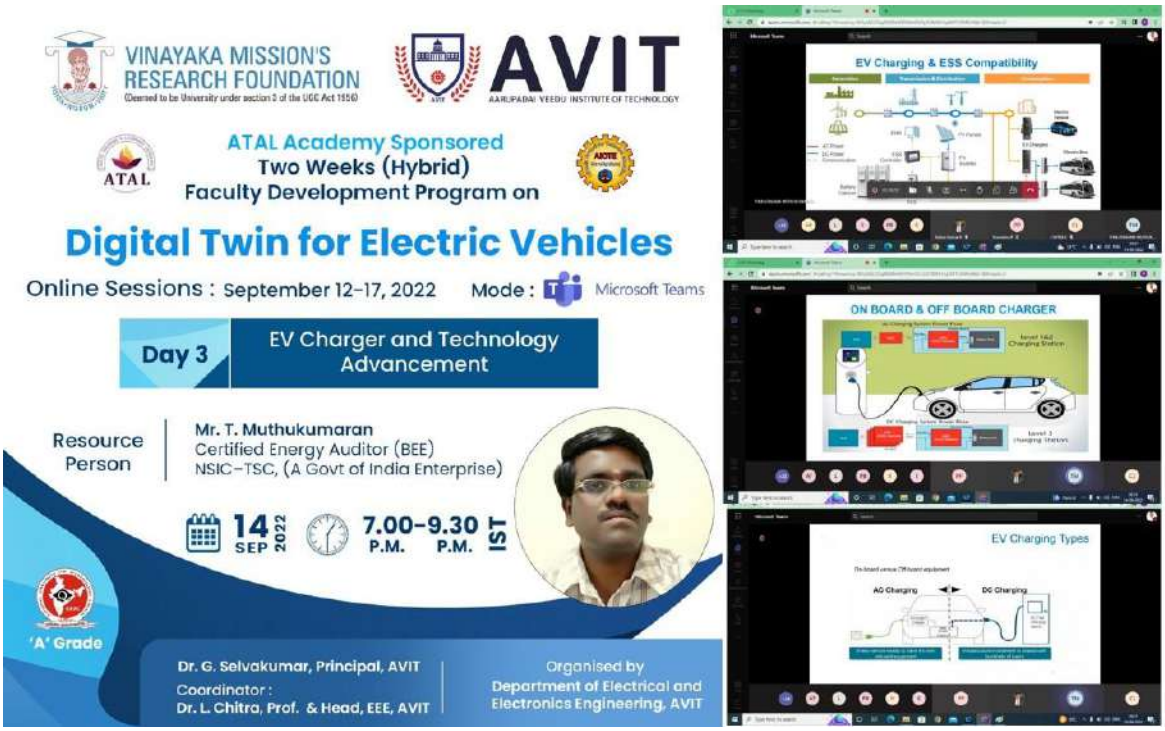


Day – 3 : 14/09/2022.

Topic: EV Charger and Technology Advancement

The third day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr.S.Prakash Co-coordinator of ATAL FDP and AP(Gr-II) / EEE. The resource person for the ATAL FDP was Mr.T. Muthukumaran, Certified Energy Auditor (BEE), NSIC–TSC, (A Govt Of India Enterprise). Then the session was taken over by the T. Muthukumaran. The topics covered by the resource person are as follows :

- Future & Types of Electric Vehicles
- Components of EV Vehicles
- Ecosystem
- Charging Methodology – Types
- EV Retrofitting
- Why cars will be Electric by 2030
- Traction Battery
- Battery Balancing & Telematics
- EV Charging & ESS Compatibility
- Typical Layout of EV charging station & EV Charging Standards
- Charging Calculation
- Test and Repair Infrastructure
- Incentives From Government To Support EV Growth
- Possible combinations of Chargers



Day – 4 : 15/09/2022.

Topic: Transforming Future mobility with applied IOT

The fourth day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr.V.Rattankumar, AP(Gr-II) / EEE. The resource person for the ATAL FDP was Mr. Suryender Kumar Sharma, Manager – IIOT, JK Cements Limited. Then the session was taken over by the Mr. Suryender Kumar. The topics covered by the resource person are asfollows :

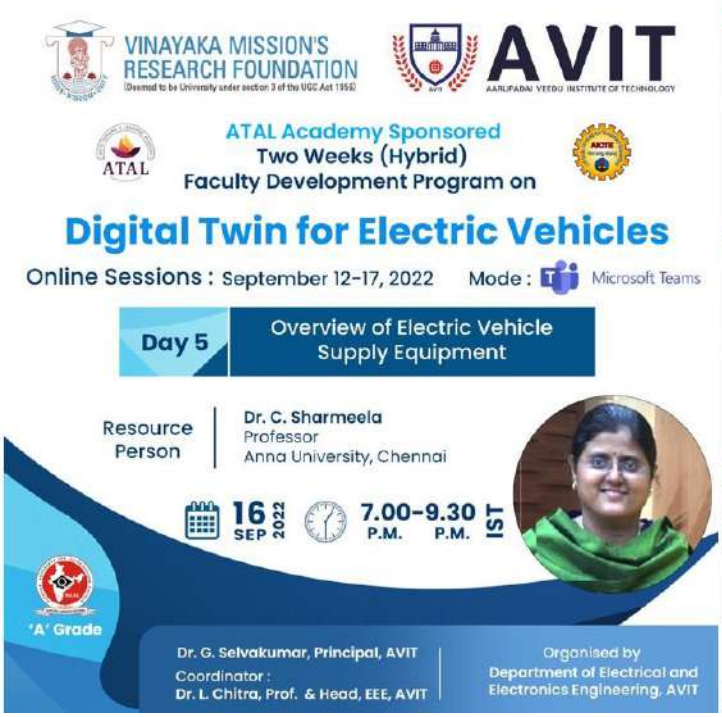
- Industrial revolution and Industry 4.0 emerging technologies
- Understanding IoT components
- IoT Value add services
- EV and Internal combustion vehicles
- E-mobility at a glance - Challenges, opportunities and use cases
- Way forward Possible combinations of Chargers

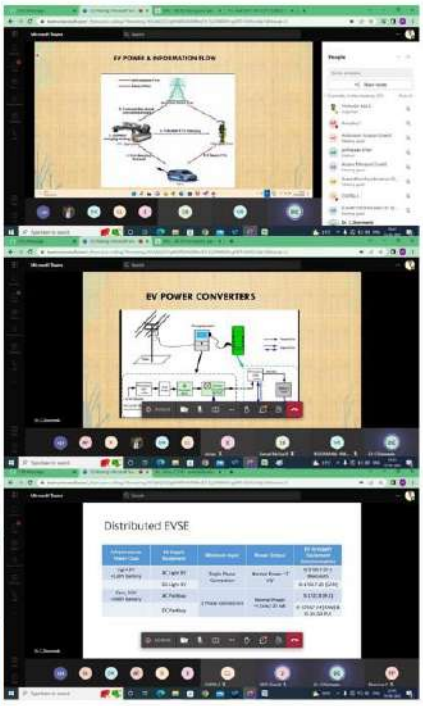
Day – 5 : 16/09/2022.

Topic: Overview of Electric Vehicle Supply Equipment

The fifth day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr.P.Poornima, AP(Gr-II) / EEE. The resource person for the ATAL FDP was Dr.C.Sharmeela, Professor, Anna University. Then the session was taken over by the Dr.C.Sharmeela. The topics covered by the resource person are as follows :

- Installed Generation Capacity (fuel wise)
- Government Initiatives to Promote Wind & Solar Energy In India
- E-Mobility and Global EV Sales for 2021
- FAME India scheme
- Distributed/ Normal Power Charge Points
- High Power Charging Stations
- AC EV supply equipment
- Slow and Fast Connector
- Connectors DC (62196.3)
- Grid Supportive EV Infrastructure
- V2G/ Bidirectional Charging
- Research challenges in EVSE



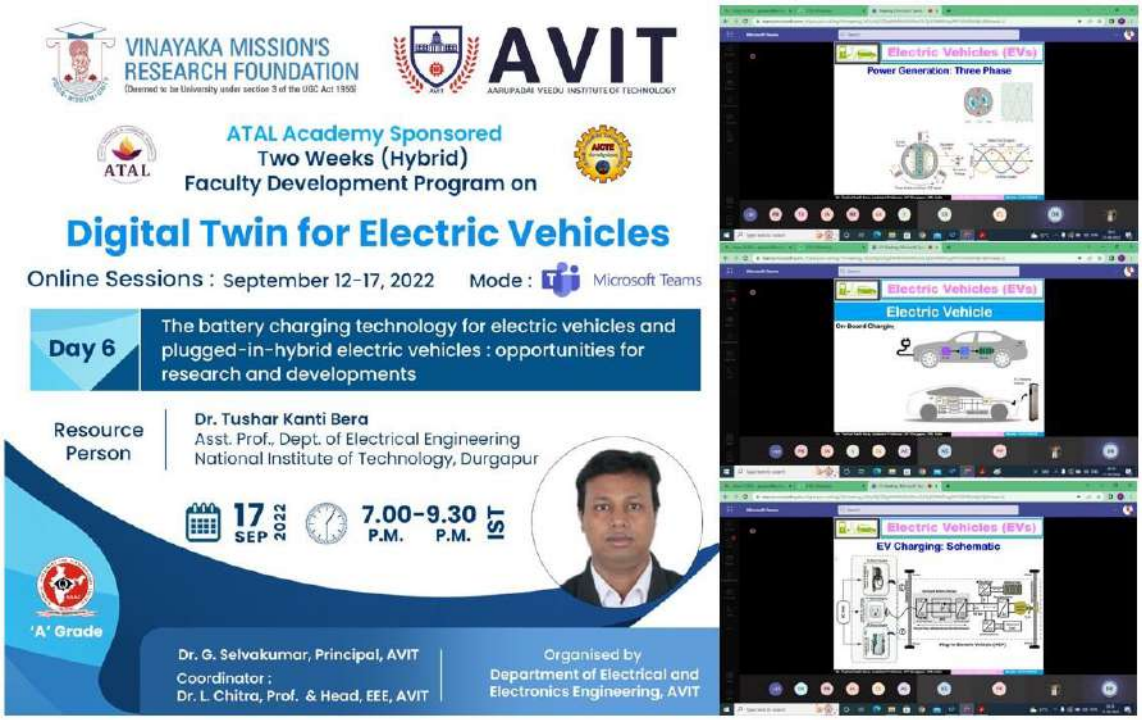


<u>Day – 6 : 17/09/2022.</u>

<u>Topic: The Battery Charging Technology For Electric Vehicles and Plugged – In - Hybrid Electric Vehicles : Opportunities For Research and Developments</u>

The sixth day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr.P.Poornima, AP(Gr-II) / EEE. The resource person for the ATAL FDP was Dr.Tushar kanti Bera , Assistant Professor/EEE , National Institute of Technology, Durgapur. Then the session was taken over by the Dr.Tushar kanti Bera. The topics covered by the resource person are as follows :

- Introduction
- Automobile Basics
- EV Technology Basics
- EV Batteries and Battery Banks
- EV Charging
- Wireless Charging
- Smart Charging
- IoT Based Charging Station Locator
- Battery Swapping θEnvironmental Pollution by EVs
- EV Research: Opportunities and Trends



<u>Day – 7 : 19/09/2022 – FN</u>

<u>Topic: Digitization in EV Manufacturing</u>

The 7th day afternoon session started with an introduction of the guest by Dr.L.Chitra, HoD / EEE. The resource person for the ATAL FDP was Mr.Thirumalai Kumar, Head, MOM/MES Services India, Siemens Industry Software India (Pvt) Ltd. Then the session was taken over by the was Mr.Thirumalai Kumar. The topics covered by the resource person are as follows :

- The evolution towards Industry 4.0 and Holistic approach
- OpCenter Suite – Point Solutions
- Electronic content in E-Cars
- Automotive electronics manufacturing introduces new challenges
- The Electronic Design-to-Manufacturing flow
- Integrated Solution: Lean NPI (DFM and Process Preparation)
- PCB Assembly Process Planning & Box-Build Planning
- Simple management of plant-specific process plans
- Integrated Mechatronics Engineering for Automation
- Digital Enterprise Software Suite

Day – 7 : 19/09/2022 – AN

<u>Topic:</u> Introduction to Digital Twin

The seventh day forenoon session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr.S.Prakash, AP(Gr-II) / EEE. The resource person for the ATAL FDP

was Dr.R.Vijayarajeswaran. Then the session was taken over by Dr.R.Vijayarajeswaran. The topics covered by the resource person are as follows **:**

- Manufacturing Intelligence Reports
- Benefits of IOT,IIOT and Industry 4.0
- Digital Twin and 3D visualization of the plant
- list of Siemens Software & Hardware for Digitalization
- The Digital Enterprise in process industries
- Engineering tool for DCS
- SIMIT Simulation Framework
- COMOS Plant Engineering
- Features of COMOS
- Seamless integration of field devices in COMOS
- Integration of PCS7/SIMIT/COMOS Smart Charging
- Few Success Stories of SEIMENS

<u>Day – 8 : 20/09/2022</u>

<u>Topic: E-Mobility</u>

The 8th day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mrs. P.Poornima, AP(Gr-II) / EEE. The resource person for the ATAL FDP was Mr.Anil Chourasia, Senior R&D Engineer, Diamler - AG. Then the session was taken over by Mr.Anil Chourasia. The topics covered by the resource person are as follows:

- E-Mobility Design Consideration & Software Roles in E-Mobility

- Bev Major Components
- Vehicle Design Considerations
- HV Battery Packaging & Various Testing
- Bus Roller
- Isolation Monitoring System
- Weight Distribution and Packaging
- Battery Cooling and Packaging
- Other Precautions For Battery Packaging
- Harness Design : Harness Creation Process & Harness Routing Guidelines
- Clips and Clamps To Be Selected Based On The Harness Load And Mating Hole Dimensions
- Harness Components
- HV Cable Layout Design Guidelines

Day – 8 : 20/09/2022. [Industrial Visit - GIEC]

Ganesan Incubation and Entrepreneurship Center, AV Campus, Paiyanoor.

- The main intention of this center is to encourage and support the Faculty and students with innovative ideas. This is the place where Faculty & students are coming up with their new ideas and make it into new startup business.
- In this centre, they are displayed number of working models and products developed by Faculty & students.
- Center instructor explained and demonstrated the working models like
  - ✓ Laser Engraving,

- ✓ Rapid Prototype machine,
- ✓ Batteryless UPS system using a Mechanical Flywheel,
- ✓ Ultraviolet Sanitizing Robot,
- ✓ IOT based switching mechanism in Electromagnetic Engine,
- ✓ Spy Robot for Surveillance,
- ✓ Energy optimization in building using PIR sensor,
- ✓ Block removal in Underground drain pipes.

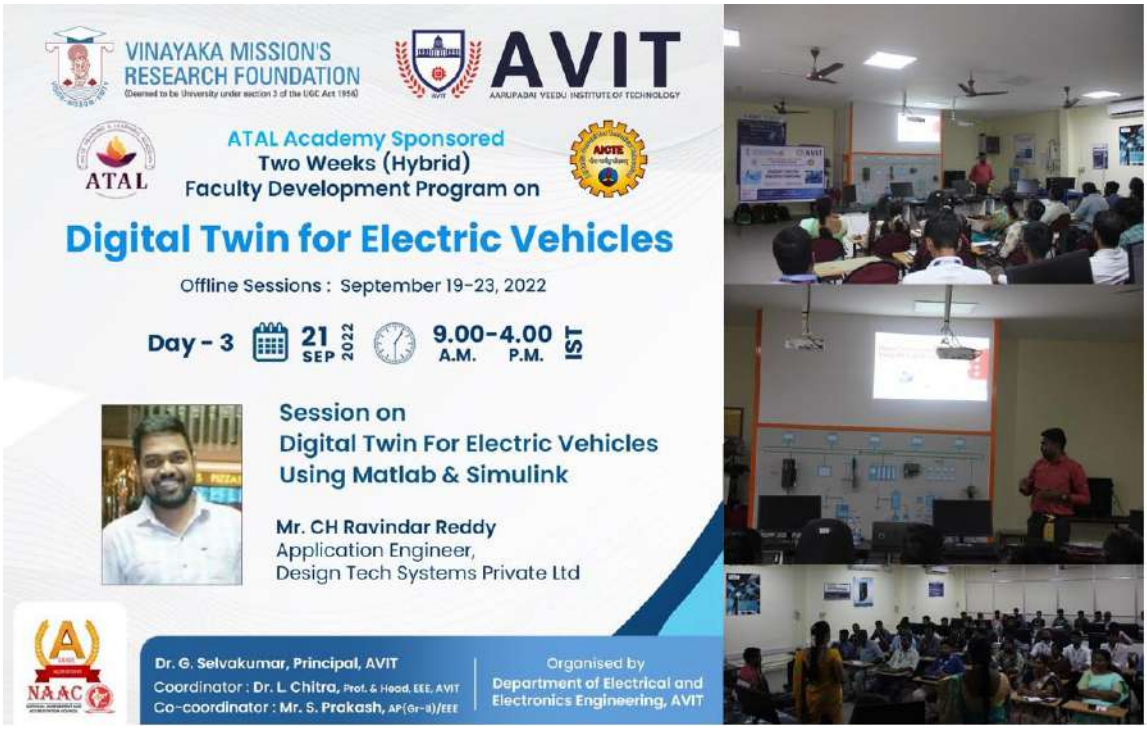
Day – 9 : 21/09/2022.

Topic: Digital Twin for Electric Vehicles using MATLAB & Simulink

The 8th day session started with a Welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr. S.Prakash, AP(Gr-II) / EEE. The resource person for the ATAL FDP was Mr.Ch.Ravindar Reddy, Application Engieer, Design Tech System Private Ltd. Then the session was taken over by Mr.Ch.Ravindar Reddy. The topics covered by the resource person are as follows:

- ❖ Digital Twin and IoT with MATLAB
- ❖ Case Study Tata Steel saved 40% energy on cooling towers through software algorithms
- ❖ Applications of Digital Twin
- ❖ Digital Twins with MATLAB and Simulink
- ❖ Industrial IoT & Markets Driving IoT
- ❖ Challenges of IoT & IoT Solutions Examples
- ❖ Common Thing Speak applications
- ❖ Tidal Depth Forecasting & Fall Detection

- Different Approaches for Modeling Dynamic Systems
- Simscape Vehicle Templates



Day – 10 : 22/09/2022 – FN

Topic: How to do Quality Research

The 10th day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mrs.P.Poornima, AP(Gr-II) / EEE. The resource person for the ATAL FDP was Dr R.Devika , Professor & Head , Department of Biotechnology /AVIT .Then the session was taken over by Dr R Devika. The topics covered by the resource person are as follows :

- How did research come in
- Objectives of Research
- Research process
- Tips for writing your thesis

Day – 10 : 22/09/2022 – AN

Topic: Industrial Visit – Tri Electric Private Limited

Tri Electric Private Limited

Gummidipoondi, Tiruvallur, Tamil Nadu

Aquila EV by Tri Electric manufactures a wide range of Electric Vehicles including Golf Carts, Sightseeing Buses, People Movers and other Commercial/Utility vehicles. Where all the assembling of EV is being explored by the interactive and informative Industrial Visit.

TE-A2+2 – 4 Seater People Mover:

The ultimate golf community vehicle. The TE-A2+2 four seat golf buggy has a rear facing extra seat and accommodates up to four adults for cruising to the clubhouse, restaurants and cafes. An extra large bag holder makes the A2D+2 equally at home on the golf course. Fully equipped for conditional registration there is a range of options including custom fitted all weather clears for added comfort.

TE-A2.HS Electric Ambulance Car

The Medi Cart is designed to satisfy the quick response needs of hotel and resort operations, leisure parks, medical & aged care facilities – anywhere an ecient and responsive cart, to accommodate an unforseen medical situation is required.

TE-S23 – 23 Seater People Mover

Designed for resorts, theme parks, nature parks and gardens, hotels and airports. In fact anywhere a quiet, stylish, convenient and efficient form of pople transporter is required. The

TE S Series 11 Seat Sightseeing Car accommodates up to eleven in comfort and a range of up to 100km. Fitted standard with a full lighting kit, hydraulic brakes, indicators & horn, windscreen and wiper, U.V. resistant metallic paint finish and two large side mounted rear view mirrors.

TE-S4.DB – Community Cart

Designed for resorts, theme parks, nature parks and gardens, hotels and airports. In fact anywhere a quiet, stylish, convenient and efficient form of people transporter is required.

Day – 11 : 23/09/2022 – FN

Topic: Time Management

The 11th day session started with a welcome note by Dr.L.Chitra, HoD / EEE and introduction of the guest by Mr.S.Prakash, AP(Gr-II) / EEE. The resource person for the ATAL FDP was Dr. G.Selvakumar, Principal /AVIT. Then the session was taken over by Dr. G.Selvakumar. The topics covered by the resource person are as follows:

- Time Management
- Benefits of time management
- Obstacles to effective time management
- Time Wasters
- 9 Mantras for Effective Time Management
- Tick When I Should Tock
- Prioritize the list of daily tasks
- Conquer Procrastination
- Fear of Success and Failure
- Planning

Day – 11 : 23/09/2022 – AN - [Valedictory Session]

The valediction started at 1.00 pm. The Welcome address was presented by Dr.L.Chitra, HoD / EEE & Coordinator of ATAL FDP. Dr.G.Selvakumar, Principal gave the presidential address. The participants who were very active in the FDP was given a token of appreciation with a book titled "Internet Of Things – Architecture and Design Principles". After a quick feedback session the vote of thanks was presented by Mr.S.Prakash, AP(Gr-II) / EEE and Co-coordinator of ATAL FDP.

Feedback Session

Books Distribution

Group Photo