Overview:

This course will explore the state-of-the-art and emerging trends in of electric machines and motor drives in electrified transportation systems, with emphasis on Electric and Hybrid Electric Vehicles. Practical challenges and opportunities in vehicle electrification will be discussed in the context of electric machine theory and power electronic control. Using a combination of research publications and actual HEV drivetrain case studies, this course will explore advancements and trends in EV/HEV powertrains and develop a broad understanding and design approaches for effective energy conversion.

Tutorial sessions involve hands-on exercises for the participants. All the sessions will be held in computer lab. The exercises would involve (i) numerical computations in open source software Scilab-Xcos, (ii) Finite Element Analysis (FEA) electromagnetic simulation in FEMM, open source software. The exercises include the use of analytical equations, simulations in numerical computational platform and finite element analysis packages. There will also be few experimental demonstrations and introduction to the use of software for machine design and power electronics-based motor control.

Objective:

The purpose of this course is to use the hybrid electric vehicle (HEV) and electric vehicle (EV) technologies as a platform to integrate fundamental concepts from electric machines, micro-controllers, signal processing and control theory. It will give an overview of the major components of powertrains in Hybrid, Plug-in Hybrid and Electric Vehicles. The operation of electric motor drives will be explored in the context of power, torque and performance in this high-efficiency system. The course will also evaluate the design of electric machines, control of adjustable speed drives for electrified transportation systems with industry-relevant examples and problems.

Courses in electric machines and drives often use a very theoretical approach with few industry-relevant examples in emerging areas such as HEVs and EVs. In addition to basic principles of electric machines and adjustable speed drives, this course will also explore practical aspects, such as loss calculation and multi-physics energy conversion for brushed DC motors, induction motors, brushless DC and switched reluctance for vehicle traction and low-voltage drive solutions.

GIAN course in Electric Machines and Drives in Electric Transportation Systems

July 18 – 22, 2022

Under the aegis of
Global Initiative of Academic Networks (GIAN)

Organized by
Discipline of Electrical Engineering
IIT Gandhinagar

An initiative of
Ministry of Education
Government of India

Who can attend?

This course is geared towards engineers seeking to advance their knowledge in the design, development and research on electric machines and drives for hybrid and electric vehicle powertrains. The course will not require any major prior experience in electric machines or automotive systems, but basic background in electrical engineering is expected. In addition to students and researchers, this course will also be suitable for practicing engineers, technologists and innovators who would like to learn about the state-of-the-art in machine design and multi-physics analysis.

Topics for discussion:

- Basics of electrified transportation
- Multi-physics nature of energy conversion in electric motors
- Advancements in traction motors
- Switched reluctance motors
- Practical considerations and case studies

Course Instructor

Dr Mahesh Krishnamurthy

Professor of Electrical Engineering,

Illinois Institute of Technology, USA

Editor-in-Chief,

IEEE Transactions on Transportation Electrification

Academic Director,

Kaplan Institute of Innovation and Tech Entrepreneurship

Director,

Grainger Power Electronics and Motor Drives Lab

Course Coordinator

Dr Ragavan K

Associate Professor (Electrical Engineering),

Indian Institute of Technology Gandhinagar

Gandhinagar

Tel: 079-23952403

Email: ragavan@iitgn.ac.in

How to apply?

This course will be conducted in-person at IIT Gandhinagar. Candidates can register themselves by submitting the registration form. The registration form can be filled by scanning this code.

Registration fees:

Faculty: INR 4000

Student: INR 2000

Industry participant: INR 8000

Lodging and boarding:

Lodging and boarding will be provided on request, made in advance and at an additional cost.

Event venue

Indian Institute of Technology Gandhinagar

Palaj, Gandhinagar – 382055, Gujarat