Master of Technology in Electric Transportation

Indian Institute of Technology Mandi,
Himachal Pradesh, India

Motivation and objectives:

India, along with several other rapidly growing economies, has recognized the imminent need for electrification of transport systems. The benefit derived from this transition will two-fold: first, it will help the country to reduce the dependence on fossil fuel that is primarily imported and has significant budgetary implications; second, with a penetration of clean fuel and renewables in the electricity generation sector, this transition will be able to contribute to mitigation of greenhouse emissions. To this end, the Government (GoI) of India has already put schemes, e.g., FAME, in action, and is actively looking for collaboration with the relevant industries and academia. While the industry is expected to focus on the production and distribution of electric vehicles, the responsibility of training the manpower for this cause is assigned to the academia.

The M.Tech in Electric transportation at IIT Mandi has been designed in alignment with the objectives of the initiative taken by the GoI and to cater to the growing demand of skilled personnel in the EV industry---both the new EV entrepreneurs and the existing ones.

Objectives of the program:

- Equipping the students with both the conceptual and practical knowledge pertaining to the electric transport industry.
- Exposing the students to cutting-edge research on electric transportation through various course projects, systems design (winter/summer short project), and dissertation.
- Enhancing their employability in the EV industry by engaging them in solving problems that originated in the industry in their year-long dissertation.

Name of the Degree Program:
Master of Technology in **Electric Transportation**

Abbreviation
Master of Technology is abbreviated as M.Tech.

Categories of Admission:
Candidates will be admitted to the M.Tech. Program of the Institute under one of the following categories:
i) Regular full-time students with Half-teaching Research Assistantship (HTRA) assistantship
ii) Regular full-time students without HTRA assistantship
iii) Full time sponsored students by the Industries, established Institutes/R&D Organizations/National laboratories without HTRA assistantship.

Duration:
The duration of this program is two years. Each year consists of two semesters, summer and winter terms. However, Half-teaching Research Assistantship (HTRA) duration will be governed as per Institute norms.

Credits to be earned:
The students have to earn minimum of 70 -72 credits for the degree of Master of Technology in this specialization. For more details on credit distribution please refer to ordinance and regulations for M.Tech./M.Sc. of IIT Mandi.

Eligibility:
a) Candidates who have qualified for the award of Bachelor's degree in Engineering / Technology with minimum first class or 60% aggregate marks (or Equivalent CGPA) in all the four years from a recognized University or Institute in **Electrical Engineering (EE), Electrical & Electronics Engineering (EEE), Instrumentation and Control, Electronics & Communication, Mechanical Engineering, Automobile, Production, Aeronautical Engineering** and who have qualified and have a valid score in Graduate Aptitude Test in Engineering (GATE) in the **EE/ME** disciplines are eligible to apply for admission to the this program.

b) For all B.Techs from IITs graduated with a CGPA of 8.0 or above, the requirement of GATE qualification is waived off.

c) A student sponsored by a recognized R&D organization, academic institution, government organization or industry with minimum first class or 60% aggregate marks (or Equivalent CGPA) in their Bachelor's degree in the aforementioned disciplines are eligible to apply for this program on a full-time basis. The Institute does not provide any assistantship to such students.

d) A candidate with Associate Membership of Professional Bodies equivalent to B.Tech in the aforementioned disciplines with minimum first class or 60% aggregate marks (or Equivalent CGPA), as approved by the Senate and having valid GATE score in **EE/ME** stream shall also be eligible to apply for admission to this program with assistantship, subject to regulations approved by the Senate. For more details on eligibility criteria please refer to ordinance and regulations for M.Tech./M.Sc. of IIT Mandi.

Number of Seats:
The number of seats shall be as approved by the Senate.

Assistantship (Fellowship/Scholarship):
The award of assistantship shall be in accordance with prevailing norms of the Institute.

Award of Degree:
Award of this M. Tech. degree shall be in accordance with the regulation of the Senate in relation to the requirements of the given program.

Campus Stay:
Students admitted to this program are required to stay in campus and to participate and complete all requirements of the program.

Exception:
Any exception to above clauses will require approval of the Senate or by the Chairman, Senate.

Note: For detailed information, please refer to ordinance and regulations for M.Tech./M.Sc. of IIT Mandi.

Course Structure

Overall Curriculum Structure:

Sr. No.	*Curriculum Structure Details*	*Credits*
1.	Discipline Core Courses (DC)	27
2.	Discipline Electives (DE)	06
3.	Open Electives from outside discipline (OE)	06
4.	Technical Communication(TC)	01
5.	Post Graduate Project (PGP-1 and PGP-2)	15+15=30
	Total No. of Credits	**70**

Suggested Course Sequence:

FIRST SEMESTER (1st Sem)

Title of the course	L-T-P-C	Remarks
Power Electronic Applications in Electric Transportation	3-0-0-3	DC
Electrical Machine and Drives in Electric Transportation	3-0-0-3	DC
Laboratory course on Power Electronics and Electrical Drives	0-0-3-2	DC
Vehicle Design and Dynamics	3-0-0-3	DC
Modeling, Simulation and Control of HEV	3-0-0-3	DC
Laboratory course on Vehicle Design and Control	0-0-3-2	DC
Technical Communication	1-0-0-1	TC

Summer/Winter Break

Title of the course	L-T-P-C	Remarks
Systems Design: EVs	0-0-3-2	DC

SECOND SEMESTER (2nd Sem)

Title of the course	L-T-P-C	Remarks
Embedded Systems and IoT for E-Transportation	3-0-0-3	DC
Laboratory course on Embedded Systems and IoT for E-Transportation	0-0-2-1	DC
Energy Storage Technologies	3-0-0-3	DC
Laboratory course on Energy Storage Technologies	0-0-3-2	DC
Discipline Elective- I	6	DE
Discipline Elective II		DE
Open Elective-I	6	OE
Open Elective - II		OE

THIRD SEMESTER (3rd Sem)

Title of the course	L-T-P-C	Remarks
PGP - 1	0-0-30-15	
Total	**15**	

FOURTH SEMESTER (4th Sem)

Title of the course	L-T-P-C	Remarks
PGP - 2	0-0-30-15	
Total	**15**	

- **Open Electives**

  Open electives are to be taken from outside the discipline of program and should be at least of 6 credits in total [As per the IIT Mandi M Tech ordinance]

List of Discipline Electives:
- Impact of E-vehicle on Power Grids
- Special Electrical machine
- Wide band gap devices for power electronics applications
- Nonlinear Analysis and Control of Power Electronic Converters
- Smart Grids
- Nonlinear Stability and Control
- Solar Photovoltaic Energy Systems
- Power quality problems and mitigation techniques in Microgrids
- Computer Aided Design of Power Electronic systems and Electrical Drives
- Finite Element Method
- Computational fluid dynamics
- Mechanical Vibration
- Design of Energy System
- Electric Vehicles: Economics, Policy and Social Embedding

A few more electives will be added as DEs.