

COURSE TITLE	SPECIAL MACHINES FOR ELECTRIC VEHICLES
COURSE CODE	01EE0713
COURSE CREDITS	3

Objective:

- 1 The objective of the course is to explore different machines for electric propulsion system of electric vehicle

Course Outcomes: After completion of this course, student will be able to:

- 1 Differentiate the construction and principles of various motors used for electric vehicle application
- 2 Analyze the performance of special machines for EVs
- 3 Determine the special machine and their drive requirement for EV application
- 4 Analyze the performance characteristics of motors for the suitability for EVs and their limitations

Pre-requisite of course:Electrical Machines

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Switched Reluctance Motor Constructional features , Principle of operation, Torque prediction, Torque –speed Characteristics, Steady state performance prediction, SR Converters Topologies, Sensor less operation of SRM , Application, Advantages and Limitations for EVs	10
2	Synchronous Reluctance Motor Constructional features, Types, Axial and Radial flux motors, Operating principles, Variable Reluctance and Hybrid Motors, Voltage and Torque Equations, Phasor diagram, Characteristics, Application, Advantages and Limitations for EVs	12
3	Permanent Magnet (PM) Synchronous Motor Fundamentals of Permanent Magnets and rare earth materials, Magnetic Characteristics and suitability for Electrical vehicles, Structure of PM Brushless Machines, Principle of PMSM Machines, EMF and Torque equations , Inverters for PM Brushless Motors Motor Control, Application, Advantages and Limitations for EVs	10

Contents : Unit	Topics	Contact Hours
4	Permanent Magnet (PM) Brushless D.C. Motor Principle of Operation, Types, Magnetic circuit analysis, EMF and torque equations, Commutation, Power Controllers, Motor characteristics and control, Torque/speed characteristics, Application, Advantages and Limitations for EVs	10
Total Hours		42

Textbook :

- 1 Chau, K.T. (2015) Electric Vehicle Machines and Drives: Design, Analysis and Application. John Wiley & Sons Ltd., Singapore, K.T.CHAU, WILEY, 2015

References:

- 1 Mehrdad Ehsani, Yimin Gao, Sebatien Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel cell vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebatien Gay and Ali Emadi, "Modern Electric, Hybrid Electric and Fuel cell vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebatien Gay and Ali Emadi, CRC Press, 2004
- 2 Electric Vehicle Technology – Explained, Electric Vehicle Technology – Explained, James Larminie and John Lory, John Wiley & Sons Ltd, 2003
- 3 Electric Vehicle Battery Systems, Electric Vehicle Battery Systems, Sandeep Dhameja, Butterworth – Heinemann, 2002
- 4 Electric and Hybrid – Electric Vehicles, Electric and Hybrid – Electric Vehicles, Ronald K Jurgens, SAE, 2002
- 5 Light Weight Electric/Hybrid Vehicle Design, Light Weight Electric/Hybrid Vehicle Design, Ron Hodgkinson and John Fenton, Butterworth –Heinemann, 2001
- 6 Electric and Hybrid Vehicles- Design Fundamentals, Electric and Hybrid Vehicles- Design Fundamentals, Iqbal Husain, CRC Press, 2011

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs, etc.

Instructional Method:

- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and classroom.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, and Virtual Laboratory

Supplementary Resources:

- 1 <https://archive.nptel.ac.in/courses/108/102/108102156/>
- 2 <https://archive.nptel.ac.in/courses/108/103/108103009/>