Vidya Pratishthan's Kamalnayan Bajaj Institute of Institute of Engineering and Technology, Baramati

Faculty of Science & Technology

Board of Studies

Electrical Engineering

Honor Degree in
Renewable Energy and E Mobility

(Pattern: 2024)

(w.e.f. AY: 2025-26)

Syllabus: Honor Degree in Renewable Energy and E Mobility (BoS: Department of Electrical Engineering)
2024 Pattern w.e.f. AY:2025-2026

Course Code	NEP Category	Sem	Courses Name	Teaching Scheme			Examination Scheme and Marks							Credits			
				TH	PR	TUT	Activity	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
EL24281	HON	III	Solar Thermal and PV system	2	2	-	10		60	30			100	2	1	-	3
EL24291	HON	IV	Hybrid and Electric Vehicle	2	2	-	10		60	30			100	2	1	-	3
EL24381	HON	V	Energy storage system for EV	3	2	-	10	30	60	30			130	3	1	-	4
EL24391	HON	VI	Electrical Machines and Drives for EV	3	2	-	10	30	60	30			130	3	1	-	4
EL24481	HON	VII	Standalone and Grid connected PV systems	3	2	-	10	30	60	30			130	3	1	-	4
Total				13	10	0	50	90	300	150	0	0	590	13	5	0	18

Mrs. J. S. Kulkarni
Dept. Autonomy Coordinator
Electrical Engg Dept.

Mrs. S. D. Rokade
Dept. Academic Coordinator
Electrical Engg Dept.

Mrs. P. N. Jaiswal
Head
Electrical Engg Dept.

Dr. C. B. Nayak
Dean Autonomy
VPKBIET, Baramati

Dr. S. M. Bhosle
Dean Academics
VPKBIET, Baramati

Dr. S. B. Lande
Principal
VPKBIET, Baramati

Principal
Vidya Pratishthan's
Kamalnayan Bajaj Institute of
Engineering & Technology, Baramati
Vidyanagari, Baramati-413133

VPKBIET BARAMATI
Affiliated to S.P.P.U. Pune
Id No./PU/PN/Engg./152/2000
PUNE (MS.)

EL24281: Solar Thermal and PV system		
Teaching Scheme: **TH: 02 Hrs/Week** **PR: 02 Hrs/Week**	**Credits:03**	**Examination Scheme:** **Course Activity: 10 Mar** **End-Semester Exam: 60 Marks** **Term Work Exam: 30 Marks**

Prerequisite Courses:

Knowledge of fundamentals of Engineering Physics and Engineering Chemistry.

Course Objectives: provide

1. To understand the concepts of solar energy.
2. To understand the fundamental principles and application of the solar thermal system.
3. To understand the concepts of solar PV Technology.
4. To study the various components of PV systems.

Course Outcomes

On completion of the course, learner will be able to:

CO-1: Discuss the principles of solar radiation, energy conversion, and solar thermal System.

CO-2: Explain the fundamental principles and application of the solar thermal system.

CO-3: Define the concepts of solar PV Technology.

CO-4: Explain components of Solar PV Systems.

Course Contents

Unit I: Introduction to Solar Energy **(7 Hrs)**

Scenario of solar energy in India, Solar Radiation: Basics of Solar Radiation, instruments for measuring solar radiation, Basics of heat transfer absorption, reflection and transmission of radiation , solar radiation geometry, empirical equations, solar radiation on tilted surfaces. Estimation of solar radiation under different climatic conditions, solar energy conversion

Unit II: Solar Thermal System (7 Hrs)

Solar Collectors: Types of solar collectors, Flat-Plate Collectors, Evacuated Tube Collectors, Parabolic Trough Collectors, Parabolic Dish Collectors, Fresnel Reflectors, Concentrating Linear Fresnel Reflectors (CLFR) working principles. Types of Solar thermal systems Basic design of different types of systems, Applications of solar thermal systems and their economics . Control systems for solar tracking Concentrating solar thermal (CSP).

Unit III : Solar Photovoltaic technology (7 Hrs)

Photovoltaic effect and its significance, Basic structure of a solar PV cell, Types of solar PV cells, I-V characteristics of a solar cell, Power-voltage (P-V) and current-voltage (I-V) curves, Efficiency of solar PV cells and its measurement. Solar PV Module, Rating of Solar PV Module, its connections and efficiency , Measuring Module Parameters, arrangements of array according to the voltage.

Unit IV: Solar PV System (6 Hrs)

PV arrays, inverters, charge controllers, batteries, Site selection Factors affecting performance on solar PV systems, and shading analysis, Basics of load estimation, energy consumption analysis, and sizing of PV systems.

Books & Other Resources:

Text Books:

1. Non-conventional Sources of Energy , G.D Rai, Khanna Publishers, Delhi -2008
2. Solar Power Hand Book, Dr. H. Naganagouda (2014)
3. Chetan Singh Solanki, "Solar Photovoltaics: Fundamental, Technologies and applications", 2nd Edition, PHI Learning Pvt. Limited, New Delhi, 2011.
4. Renewable Energy Sources and Emerging Technologies, Kothari D.P. and Signal K.C New Arrivals –PHI; 2 Edition (2011)
5. A Text book of Power System Engineering, A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, Dhanpat Rai Publication

Reference Books:

1. Renewable Energy Technologies; A Practical Guide for Beginners
2. S. P. Sukhatme, "Solar Energy - Principles of thermal collection and storage", TMH, 2008
3. A Text book of Power System Engineering, A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, Dhanpat Rai Publication

Guidelines for Laboratory - Term work Assessment:

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5. Sample calculations for one/two readings.
6. Result table.
7. Graph and Conclusions.
8. There should be continuous assessment for the TW.
9. Assessment must be based on understanding of theory, attentiveness during practical, understanding Session, how efficiently the student is able to make connections and get the results, and timely submission of journals.

List of Practicals (Any 08 to be performed by the student)

1. To study the current status, growth trends, and potential of solar energy in India
2. To prepare solar survey report for the installation of a photovoltaic (PV) system based on Site Selection Criteria, Solar Resource Assessment, Shading Analysis, Load Assessment and Energy Demand Analysis, PV System Sizing and Design Considerations.
3. To obtain I-V and P-V characteristics of PV modules for single PV module.
4. To obtain I-V and P-V characteristics of PV modules: for series and parallel connection of PV modules.
5. To observe the I-V and P-V curve of a solar cell/module with different operating temperatures.
6. To plot I-V and P-V characteristics of the Solar cell and PV array in Matlab Simulink.

7. To calculate load estimation based on electricity bill.
8. To draw a preview of solar system installation using Sketchup.
9. To design solar PV system for residential / commercial consumer.
10. To survey various apps for solar installation, operation and maintenance.
11. To study of Various Types of Photovoltaic (PV) Cells and Their Characteristics.
12. To study solar PV success story / case study.

Suggested Industrial Visit to a Solar PV Plant / Solar System Industry – Study of Installation, Operation, and Performance.

Course Activity (Any one of the following) :

1. MCQ Test.
2. Survey on solar system installation schemes .

Mrs. Pooja N. Jaswal
PAC Member 1

Mr. R. S. Tarade
PAC Member 2

for Jaswal
Mr. S. K. Raskar
PAC Member 3

VPKBIET BARAMATI PUNE (MS.)

EL24291: Hybrid & Electrical vehicles		
Teaching Scheme: **TH: 02 Hrs/Week** **PR: 02 Hrs/Week**	**Credits:03**	**Examination Scheme:** **Course Activity: 10 Marks** **In-Semester Exam: 30 Marks** **End-Semester Exam: 60 Marks** **Term work: 30 Marks**

Prerequisite Courses:

Basic Electrical Engineering and Energy and EV Technology

Course Objectives:

1. To understand the basic working and characteristic performance of Electric and Hybrid vehicles.
2. To study and understand the basic functioning of both Electric and Hybrid vehicles and the drivetrain topologies.
3. To understand the different concepts of charging related to both Electric and Hybrid vehicles operation & energy management.
4. To design different battery components in consideration with issues of Electric and Hybrid vehicles.

Course Outcomes

On completion of the course, learner will be able to:

CO-1: Get a good understanding of the basic functioning of both Electric and Hybrid vehicles and their performance

CO-2: To understand the fundamentals of chargers related to both electric & hybrid vehicle operation & energy management.

CO-3: To understand electric propulsion systems, types of motors and the other important subsystems in Electric vehicles.

CO-4: To design various components in Electric and Hybrid vehicles with design considerations.

Course Contents

Unit 1:Introduction & Architecture of EV **(07 Hrs.)**

A] Introduction To EV: (03 Hrs.)

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, Classification of EV.

B] Architecture Of HEV: (04 Hrs.)

Series HEV, Parallel HEV and Series-Parallel HEV, Power flow control in hybrid drive train topologies: Series hybrid drivetrain, Parallel hybrid drivetrain and Series-Parallel hybrid drivetrain.

Unit 2: Plug-In Hybrid Electric Vehicles & Fundamentals of Chargers (07 Hrs.)

A] Plug-In Hybrid Electric Vehicles: (04 Hrs.) Introduction, Functions and Benefits of PHEV, Operating Principles of Plug- in Hybrid Vehicle: Charge-Depleting Mode, Charge Sustaining Mode, AER Mode, Engine-Maintenance Mode, Control Strategy of PHEV, PHEV-Related Technologies and Challenges

B] Fundamentals of Chargers: (03 Hrs.)

Charger Classification and Standards, Charger Requirements, Topology Selection for Level 1 and 2 AC Chargers: Front-End AC–DC Converter Topologies, Isolated DC–DC Converter Topologies, Wireless Chargers.

Unit 3 :Electric Propulsion Systems & motor drives (07 Hrs.)

A] Electric Propulsion Systems: (04 Hrs.)

Introduction to electric components used in HEV's, DC motor drives: Combined armature and Field control method, Chopper control DC drives, Multi quadrant control of Chopper fed DC drive.

B] Permanent Magnet BLDC & SRM Motor Drives: (04 Hrs.)

Closed loop Torque control of BLDC motor drive and sensor less Control of BLDC Motor drive using Back EMF method, Switched Reluctance Motor drives: basic magnetic structure, modes of operation, different inverter topologies of SRM drives.

Unit 4 : Components & Design Considerations of EV & HEV: (06 Hrs.)

Design parameters of batteries, ultra-capacitors and fuel cells, aerodynamic considerations, calculation of the rolling resistance and the grade resistance, calculation of the acceleration force, total tractive effort, torque required on the drive wheel, transmission efficiency, consideration of vehicle mass, electric vehicle chassis & body design, general issues in design, specifications and sizing of components.

Books & Other Resources:

Text Books:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.

2. Ali Emadi, "Advanced Electrical Hybrid Vehicles" CRC Press, 2015, Taylor & Francis Group.

3. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.

Reference Books:

1.T. Denton, "Electric and Hybrid Vehicles", Routledge,2016.

2.S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies",Springer, 2015.

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5. Sample calculations for one/two readings.
6. Result table.
7. Graph and Conclusions.
8. There should be continuous assessment for the TW.
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LIST OF PRACTICALS (Any 08 to be performed by the student)

1. Study of fundamentals of Electric Vehicle.
2. MATLAB simulation study of a SOC control of lithium-ion battery.
3. MATLAB simulation study of a battery protection.
4. MATLAB simulation study of a BMS.
5. MATLAB simulation study of a BMS for passive cell balancing.
6. MATLAB simulation study of a battery controller based on SOC for charging of EV charging.
7. MATLAB simulation study of a battery controller based on SOC for charging of EV discharging.
8. Study of discharging characteristic of BMS.
9. Study of charging characteristic of BMS.
10. Study of cell balancing phenomenon of BMS.
11. MATLAB simulation study of a battery pack with cell balancing circuits in Simscape.
12. MATLAB simulation study of battery passive cell balancing to plot SOC.
13. MATLAB Simulation study of PEM Electrolysis System.
14. MATLAB simulation study of PEM fuel cell system.

Note:
The list of experiments is not limited to the above, but a course coordinator may design a few new experiments based on recent technologies/trends in the relevant Engineering Domain. However, the course coordinator needs to get approval by the Program Assessment Committee and Chairman BOS/HOD well in time.

Course Activity (Any one of the following) :

1. Concept test
2. PowerPoint presentation

Mrs.V.V.Deokate	Mrs.P.N.Jaiswal	Mr.P.D. Upadhye
PAC Member 1	PAC Member 2	PAC Member 3

EL24381: Energy Storage System for EV		
Teaching Scheme: **TH: 03 Hrs/Week** **PR: 02 Hrs/Week**	**Credits: 04**	**Examination Scheme:** **Course Activity: 10 Marks** **In-Semester Exam: 30 Marks** **End-Semester Exam: 60 Marks** **Term-Work: 30 Marks**

Prerequisite Courses:

Basic Electrical Engineering, Energy and EV Technology, Hybrid and Electric Vehicle

Course Objectives:

1. To understand the fundamental principles and significance of energy storage systems
2. To describe types and applications of chemical energy storage system
3. To describe principle and applications of electromagnetic energy storage system
4. To compare the battery and supercapacitor for ESS
5. To calculate the various parameters of battery and battery pack
6. To discuss standards, safety, and applications of electrical energy storage

Course Outcomes

On completion of the course, learner will be able to:

CO-1: Explain the need, technologies, and applications of energy storage systems in power systems and electric vehicles.

CO-2: Describe types and applications of chemical energy storage system

CO-3: Describe principle and applications of electromagnetic energy storage system

CO-4: Compare the battery and supercapacitor for ESS

CO-5: Calculate the various parameters of battery and battery pack

CO-6: Discuss standards, safety, and applications of electrical energy storage

Course Contents

Unit I: Introduction **(6 Hrs)**

Energy storage systems overview - Scope of energy storage, Needs and opportunities in energy storage, Technology overview and key disciplines, Comparison of time scale of storages and applications, Energy storage in the power and transportation sectors. Importance of energy storage systems in electric vehicles, Current electric vehicle market.

Unit II: Chemical Energy Storage System **(6 Hrs)**

Concept of chemical energy storage, Hydrogen production and storage, Principle of direct energy conversion using fuel cells, thermodynamics of fuel cells, Types of fuel cells, Fuel cell performance, Application of chemical energy storage system, Advantages and limitations of chemical energy storage, Challenges, and Future prospects of chemical storage systems.

Unit III: Electromagnetic Storage Systems **(7 Hrs)**

Concept of electromagnetic energy storage, Double Layer Capacitors (DLC) with electrostatically charge storage, Superconducting Magnetic Energy Storage (SMES), Application of electromagnetic storage system, Advantages and limitations of electromagnetic energy storage systems, Challenges, and Future prospects of electromagnetic storage systems.

Unit IV: Electrochemical Storage System **(7 Hrs)**

(a) Batteries-Working principle of battery, Battery performance evaluation methods, Li-Air Batteries, Li-Sulphur Batteries, Li resources and recycling of Li-ion batteries

(b) Supercapacitors- Working principle of supercapacitor, Types of supercapacitor, Difference between battery and supercapacitors

Unit V: Battery Management Systems (BMS) **(7 Hrs)**

Introduction to BMS, Objectives of the BMS: Discharging control, Charging control, State-of-Charge determination, State-of-Health determination, Causes of cell imbalance, Cell Balancing techniques: Active cell balancing and passive cell balancing, BMS topologies: Distributed Topology, Modular Topology and Centralized Topology, Certification, Benefits of BMS.

Unit VI: Standards, Safety and Applications of Electrical Energy Storage **(6 Hrs)**

Standards and Safety for ESS, Renewable energy storage-Battery sizing and stand-alone applications, stationary (Power Grid application), Small scale application-Portable storage systems and medical devices, Mobile storage applications- Electric Vehicles (EVs), Future technologies, Hybrid systems for energy storage.

Books & Other Resources:

Text Books:

1. Frank S. Barnes and Jonah G. Levine, Large Energy Storage Systems Handbook (Mechanical and Aerospace Engineering Series), CRC press (2011)
2. Ralph Zito, Energy storage: A new approach, Wiley (2010)
3. Energy Storage - Technologies and Applications by Ahmed Faheem Zobaa, InTech
4. Fundamentals of Energy Storage by J. Jensen and B. Sorenson, Wiley-Interscalene, NewYork,

5. Energy Storage: Fundamentals, Materials and Applications, by Huggins R. A., Springer.

Reference Books:

1. Pistoia, Gianfranco, and Boryann Liaw. Behaviour of Lithium-Ion Batteries in Electric Vehicles: Battery Health, Performance, Safety, and Cost. Springer International Publishing AG, 2018.
2. Robert A. Huggins, Energy storage, Springer Science & Business Media (2010)
3. Thermal energy storage: Systems and Applications by Dincer I. and Rosen M. A., Wileypub.
4. Energy Storage: Fundamentals, Materials and Applications, by Huggins R. A., Springer.
5. Electric & Hybrid Vehicles by G. Pistoia, Elsevier B. V.
6. Fuel cell Fundamentals by R. O' Hayre, S. Cha, W. Colella and F. B. Prinz, Wiley Pub.
7. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.

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LIST OF PRACTICALS (Any 08 to be performed by the student)

1. Study of voltage current characteristic and power curve of PEM fuel cell.
2. Study of the PEM fuel cell with variable loads.

3. Study of hydrogen generator and its application.
4. Study of hydrogen storage technologies
5. Study of Li-Air Batteries and Li-Sulphur Batteries
6. MATLAB simulation study of a supercapacitor model
7. MATLAB simulation study of a supercapacitor charging and discharging behaviour.
8. Study of BMS and measure voltage across each battery
9. Study of thermal management in BMS
10. MATLAB Simulation study of PEM Electrolysis System
11. MATLAB simulation study of PEM fuel cell system
12. MATLAB simulation of Hybrid Energy System with solar, wind, battery and fuel cell
13. MATLAB simulation of Battery-Supercapacitor Hybrid Storage system
14. MATLAB simulation of Battery Energy Storage System Model

Mr. D. S. Yeole	Dr. G. S. Gadge	Mrs. S. D. Rokade
PAC Member 1	PAC Member 2	PAC Member 3

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EL24391: Electrical Machines and Drives for EV		
Teaching Scheme: **TH: 03 Hrs/Week** **PR: 02 Hrs/Week**	**Credits:04**	**Examination Scheme:** **Course Activity: 10 Marks** **In-Semester Exam: 30 Marks** **End-Semester Exam: 60 Marks** **Term-Work: 30 Marks**

Prerequisite Courses:

Basic Electrical Engineering, Electromagnetic theory, knowledge of semiconductor devices and their application in power electronics.

Course Objectives:

1. To provide students with a foundational understanding of electric vehicles (EVs) and the role of electric machines in their propulsion systems.
2. To introduce students to the fundamental principles of electric machines and their applications in various engineering contexts.
3. To familiarize students with the operating principles and design considerations specific to Permanent Magnet Synchronous Motors (PMSMs) in the context of electric vehicles
4. To provide students with an understanding of the operating principles and applications of induction motors in the context of electric vehicles
5. To acquaint students with the operating principles, design considerations, and control strategies of Brushless DC (BLDC) motors in the context of electric vehicles
6. To equip students with an understanding of various motor control strategies employed in electric vehicles for optimizing performance

Course Outcomes

Upon successful completion of this course, the students will be able to:

CO1: Explain the key components of electric vehicles and discuss the significance of electric machines in enabling sustainable and efficient transportation.

CO2: Differentiate between different types of electric machines, analyze their performance parameters, and apply basic design considerations for specific applications.

CO3 : Explain the advantages of using PMSMs in electric vehicles, assess their design considerations, and optimize their performance.

CO4: Describe the advantages and limitations of induction motors, assess their design considerations for electric vehicles, and optimize their performance.

CO5: Explain the advantages of using BLDC motors in electric vehicles, assess their design considerations, and implement control strategies for efficient operation.

CO6 : Implement and evaluate different motor control strategies, including speed control, torque control, and regenerative braking, to achieve precise and efficient control in electric vehicle applications

Course Contents

Unit I: Introduction to Electric Vehicles (EVs) and Electric Machines (7 Hrs)

Definition and Overview of Electric Vehicles, evolution of electric vehicles, key components of EV - Battery System, Electric Motors: Types and Functions, Power Electronics: Inverters and Converters, Electric Vehicle Control Systems, Charging Infrastructure: Overview and Types, Significance of electric machines in EVs, Environmental and Economic Drivers for EV Adoption, Challenges and opportunities in electric vehicle propulsion systems.

Unit II: Electric Machine Fundamentals (7 Hrs)

Electromagnetic principles underlying electric machines, Role of Electric Machines in EV propulsion, Energy Efficiency and Environmental Impact, Comparison with Internal Combustion Engine Vehicles, Types of electric machines used in electric vehicles – Introduction to DC Motors, ac motors, BLDC motors and PMSM motors Types, Performance characteristics and parameters, Efficiency and losses in electric machines, Comparison of Motor Types for EVs.

Unit III: Permanent Magnet Synchronous Motors (PMSMs) in Electric Vehicles (7 Hrs)

Construction, Operating principle of PMSM, Design considerations for PMSMs in EV applications, PMSM Drive: Construction (Block diagram) and working for motoring and regenerative braking, Speed and torque Characteristics, Comparison between PMSMs and other motor types in EVs.

Unit IV: Induction Motors in Electric Vehicles (7 Hrs)

Construction, Operating principle of induction motor, Design considerations for induction motors in EV applications, Production of torque, torque-slip relation, condition for maximum torque, torque-slip Characteristics, Speed control strategies for induction motors, Regenerative breaking, Advantages and limitations of using induction motors in EVs.

Unit V: BLDC Motors in Electric Vehicles **(7 Hrs)**

Construction and working principal of BLDC Motor, BLDC Drives :Construction (Block diagram) and working for motoring and regenerative braking, Speed and torque characteristics, closed loop control of BLDC drive (PI controller) , vector control of BLDC drive, advantages and limitations of BLDC motors.

Unit VI: Motor Control Strategies for Electric Vehicles **(7 Hrs)**

Importance of Motor Control in Electric Vehicles, Challenges and Opportunities in Electric Vehicle Motor Control, speed control strategies - Open-loop control, closed-loop control, PID control for speed regulation, torque control strategies – direct torque control and field-oriented control (FOC), Regenerative Braking system - Principle of Regenerative Braking, Regenerative braking control, sensorless control techniques for electric drives.

Books & Other Resources:

Text Books:

1. G. K. Dubey, "Fundamentals of Electric Drives", 2nd Edition, Narosa Publishing House
2. N. K. De, P. K. Sen, "Electric Drives", Prentice Hall of India Eastern Economy Edition
3. Ashfaq Husain, "Electrical Machines", Dhanpat Rai& Sons.
4. S. K. Pillai, "Analysis of Thyristor Power Conditioned Motors", University Press
5. G.K. Dubey, "Power Semiconductor controlled drives", PHI publication
6. Nagrath & Kothari, "Electrical Machines", Tata McGraw Hill

Reference Books:

1. R. Krishnan, "Electric Motor Drives – Modeling Analysis and Control", PHI India
2. A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans, "Electrical Machines", TataMcGraw Hill Publication Ltd., Fifth Edition.
3. Austin Huges, "Electrical motor and drives: Fundamental, types and applications", Heinemann Newnes, London
4. Charles I Hubert, "Electrical Machines Theory, Application, & Control", Pearson Education, New Delhi, Second Edition.
5. B. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education

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LIST OF PRACTICALS (Any 08 to be performed by the student)

1. Speed control characteristics of single phase fully converter fed Brushless D.C. motor.
2. Speed control characteristics of 3-ph fully converter fed Brushless D.C. motor.
3. Speed control characteristics of VSI fed 3 phase Induction motor (using V/f control PWM inverter).
4. To study speed control of 3 phase Induction motor.
5. Study of constant torque and constant power characteristic of induction motor.

6. Simulation of closed loop control of BLDC / PMSM drive.
7. Simulation of vector control of PMSM/BLDC motor.
8. Simulation of Induction Motor Vector Control.
9. To perform No load & blocked-rotor test on 3-phase induction motor to determine equivalent circuit parameters.
10. Electrical braking of 3 phases Induction Motor (DC Dynamic Braking, Plugging, Regenerative Braking.

Note: The list of experiments is not limited to the above, but a course coordinator may design a few new experiments based on recent technologies/trends in the relevant Engineering Domain. However, the course coordinator needs to get approval by the Program Assessment Committee and Chairman BOS/HOD well in time.

Course Activities (Any ONE of the following):

For the assessment of Course Activity, a student must complete at least ONE activity out of the following:

1. Quiz based on numerical techniques.
2. Poster presentation on different algorithms.

Dr. H. M. Shaikh	Dr. G. S. Gadge	Mr. A. V. Golande
Course Coordinator	PAC member 1	PAC member 2

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