MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)
NAAC Accredited with A++ Grade

Flexible Scheme & Syllabus

2021-2022

B.Tech.

in

Electrical Engineering

(IVSemester)

Madhav Institute of Technology & Science

Gwalior-474005

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Electrical Machines-I: 2130312

Course Objectives:

- To develop basic concepts of AC and DC machines, their constructional details and working principles and
- To familiarize the students with the practical applications and operational issues of transformer, induction motor and DC machines.

Unit- I Single Phase Transformer: Phasor diagram, Efficiency and voltage regulation, All day efficiency. Testing of Transformers-O.C. and S.C. tests, Sumpner's test, and Polarity test. Auto Transformer- Single phase and three phase auto transformers, Volt-amp relation, Efficiency, Merits &demerits and applications.

Unit- II D.C. Machines I: Construction of DC Machines, Armature winding, EMF and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of DC generators.

Unit- III D.C. Machines II: Performance characteristics of DC motors, Starting of DC motors; 3point and 4 point starters, Speed control of DC motors; Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test).

Unit- IV Three Phase Induction Motor : Review of constructional details. Principle of operation, Slip. Production of torque, Steady state analysis. Phasor diagram, equivalent circuit. Power flow diagram and Torque speed characteristics. Starting methods.

Unit-V: Induction Motor II: Circle diagram and its experimental determination, cogging and Crawling Losses, Efficiency and Testing I.M, Double cage induction motor, Operation on unbalanced voltages, Speed control, Rotor resistance control, pole changing method, Frequency control, Induction generator,Introduction to Single phase Induction motor.

Recommended Books:

1. Electric Machines by D.P. Kothari &I.J. Nagrath, Tata McGraw Hill
2. Electric Machines by Ashfaq Hussain, Dhanpat Rai & Company
3. Electric Machinery by A.EFitzerald, Kingsley and S.D. Umans, McGraw Hill.
4. Electrical Machinery by P.S. Bimbhra, Khanna Publisher
5. Generalized Theory of Electrical Machines by P.S. Bimbhra, Khanna Publishers
6. Alternating Current Machines by M.G.Say, Pitman & Sons

Course Outcome (CO)

CO 1. Explain the principles and construction of different AC and DC machines.
CO 2. Discuss the fundamental control practices such as starting, reversing, braking, plugging etc. associated with AC and DC machines.
CO 3. Analyzethe performance of AC and DC machines.
CO 4. Develop the equivalent circuits and compute the induced emf, torque, efficiency, losses etc.
CO 5. Describevarious tests conducted for evaluating the performance of AC and DC machines.
CO 6. Evaluate the performance of machines under different operating conditions.

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Electrical Machines-I Lab: 2130312

LIST OF EXPERIMENTS

1. To Perform direct load test on single phase transformer
2. To perform parallel operation on two single phase transformers
3. To obtain magnetization characteristics of DC shunt generator
4. To obtain internal and external characteristics of DC shunt generator
5. To control the speed of DC shunt motor(Armature and Field Control)
6. To perform load test on DC shunt motor (Mechanically loaded)
7. To perform load test on DC compound motor (Electrically loaded)
8. To perform various three phase transformer connections
9. To perform load test on induction motor
10. To conduct No Load & Blocked Rotor Test on 3-Ph Slip Ring Induction Motor and plot performance curve.
11. To obtain speed torque characteristics of 3 phase induction motor.
12. A virtual lab simulation of conventional electrical machines.

Course outcomes

CO 1. Draw characteristics of electric machine for a specific purpose, requirement.
CO 2. Determine the efficiency of any transformer, regulation of any transformer.
CO 3. Conduct Load sharing by two or more machines
CO 4. Develop the ability to work in team and learns professional ethics

Skill Based Mini Project

Electrical Machines-I

1. Draw the LAP connected winding arrangement of DC Machines
2. Draw the WAVE connected winding arrangement of DC Machines
3. Draw the construction of DC Machines and also explain its parts
4. Draw the construction of Induction Machines and also explain its parts
5. Draw the phasor diagram of single-phase transformers in lagging, leading and unity power factor load
6. Draw the phasor diagram of 3-phase Induction motor in lagging, leading and unity power factor load
7. Draw the MMF diagram of DC Machines and also explain the effect of Armature reaction
8. How are torque are produced in DC and AC Machines.
9. Discuss with suitable diagrams compare AC and DC Machines
10. Write applications of DC and AC machines in various domestic and Industrial applications

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Power System –I: 2130313

Course Objectives

To Familiarize the students with conventional and Non-Conventional energy sources and their use in electrical power generation.

To expose the students with Transmission and distribution system, line parameters, performance oftransmission lines, power plant economics and different types of tariffs.

Unit 1: Energy Resources and Electrical Power Generation: Introduction to Conventional and non-conventional energy resources; National and International energy trends; Global warming and greenhouse effects. Generation of electrical power, overview of conventional power generation: Hydro, Thermal, Nuclear and Gas Power; Renewable energy generation.

Unit 2: Transmission and Distribution Systems: Introduction, electrical supply system, comparison of AC and DC systems : conductor volume etc., overhead versus underground systems, choice of working voltages for transmission and distribution, transmission and distribution systems, Overhead line insulators, types of insulators pin, suspension and strain insulators, insulator materials, insulator string; Calculation of voltage distribution and string efficiency, methods of equalizing voltages, use of guard rings. Corona.

Unit 3: Line Parameters: Types of conductor, Inductance of a conductor due to internal flux, Inductance of a single phase & three phase transmission line, Self & mutual G.M.D., Inductance of three phase symmetrical and unsymmetrical spaced lines, transposed lines. Bundle conductors, skin effect, capacitance of single & three phase transmission line, effect of earth and charging current, transmission line communication and line interference.

Unit 4: Performance of Overhead Transmission Line: Single line diagram of power system, ABCD constant and equivalent circuits of short, medium and long transmission line, regulation and efficiency of short, medium, transmission line, Ferranti effect, surge impedance loading. Long transmission line, Generalized circuit equation relation between generalized circuit constant for simple network

Unit-5 Power plants Economics and Tariff: Size and number of generating units. Effect of load factor on cost of generation, Load curves, Maximum demand, Load factor, diversity factor, Plant capacity and plant use factor, type of tariffs and economics of power factor improvements.

Recommended Books:

1. Electric Power Generation, Transmission and Distribution by S.N. Singh, Prentice Hall of India, 2nd Edition.
2. Power system Analysis by A. Husain A, CBS Pub & Distributor.
3. Power System Analysis by B.R. Gupta B.R, S Chand & Co.
4. Electrical Power by S.L. Uppal, Khanna Publishers Limited, New Delhi.
5. Electrical Power Systems by C.L.Wadhwa, New Age International Publishers Ltd., New Delhi

Course Outcomes

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

CO 1. Describe the general structure and supply systems used in power systems

CO 2. Develop the knowledge of generation of electricity based on conventional and nonconventional energy sources

CO 3. Evaluate the string efficiency, corona losses etc.

CO 4. Determine the transmission line parameters

CO 5. Analyze the performance of overhead transmission line

CO 6. Describe the concept of power plant economics, types of tariffs and power factor economics

Power System-I Lab: 2130313

List of Experiments:

1. To study EHV AC Transmission Line Simulation Panel.

2. To measure resistance, inductance and capacitance of EHV AC Transmission Line Simulation Panel.
3. To study cables, insulators and line supports used in transmission and distribution system
4. To calculate generalized circuit constants for short, medium and long transmission line of EHV AC Transmission Line Simulation Panel.
5. To simulate L-G, L-L, L-L-G, L-L-L, L-L-L-G faults using MATLAB
6. To write MATLAB code to determine the maximum power without loss of synchronism using equal area criterion
7. To write MATLAB code for determination of the critical clearing angle and critical clearing time.
8. To determine the system stability from the swing curve.
9. To determine stability of the system using MATLAB.
10. A visit and study of 33kV Substation.

Course Outcomes:

At the end of the Laboratory work the students will be able to
CO1 Determine transmission line parameters.
CO2 Simulate the different types of faults in transmission lines using MATLAB.
CO3 Identify the different components of substation & their applications
CO4 Familiar with construction & application of various insulators, cables & line support.
CO5 Prepare a report for presentation

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MICROPROCESSORS & EMBEDDED SYSTEMS: 130416

Course Objective:

- To provide fundamental operating concepts of microprocessors and microcontrollers.
- This course aims to provide students with a solid theoretical basis as well as comprehensive professional understanding of Arduino and Raspberry Pi.

Unit I. Microprocessors:8085-architecture, operation, pin configuration and functions, bus organization, control signal generation for external operations-fetch, IO/M, read/write, machine cycles and bus timings. Addressing mode, instruction set, Overview/concept of peripheral interfacing devices-8251, 8253, 8255 and 8279.

Unit II. Microcontrollers: 8051-architecture, operation, pin configuration and functions, memory organization, register, I/O ports, addressing modes, instruction sets, instruction classification. Assembly language programming, Interrupts in 8051. Timer/Counter programming for time delay generation and waveform generation. Interfacing with ADC, DAC, LEDs and seven segment display.

Unit III. Arduino: Introduction to the Arduino, creating an Arduino programming Environment, Arduino IDE, creating an Arduino program, Arduino Libraries, Analog and Digital Interfacing, Adding Interrupts, communicating with devices and sensors.

Unit IV. Raspberry Pi: Introduction to the Raspberry Pi, basic functionality of the Raspberry Pi board and its processor, setting and configuring the board, programming on Raspberry Pi, python programming environment, python expressions, general purpose IO pins, Protocol pins, RPi,GPIO library, communicating with devices and sensors.

Unit V. IoT application using Arduino and Raspberry Pi: Arduino- Playing tones and a melody, alphanumeric LCD display, speed and direction control, temperature and humidity sensor interfacing. Raspberry Pi -controlling LED, interfacing an LED and Switch, Interfacing a Light Sensor (LDR), camera interfacing etc.

Recommended Books:

1. "8085 Microprocessors Architecture Application and Programming", Ramesh S. Goankar, Penram International, 5th Edition.
2. "The 8051 Microcontroller", Kenneth J. Ayala, Cangage learning, 3rd Edition.
3. "Arduino Cookbook", Michael Margolis, O'Reilly Media, Inc., 1st Edition.
4. "Arduino for beginners: Essential Skills Every Maker Needs", John Baichtal, Person Education, Inc., 1st Edition.
5. "Raspberry Pi User Guide", Eben Upton and Gareth Halfacree, August 2016, 4th Edition, John Wiley & Sons.
6. "Programming with Raspberry Pi: Getting Started with Python", Simon Monk, January 2012, McGraw Hill Professional.

Course Outcomes:

After the completion of the course, the student will be able to –

CO 1. **Distinguish** various types of processor architectures.
CO 2. **Describe** architecture, memory organization of 8085 and 8051.
CO 3. **Create** sketches, libraries and Arduino development environment.
CO 4. **Design** Raspberry Pi hardware and implement program.
CO 5. **Develop** interfacing between different sensors and Arduino / Raspberry Pi.

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Programming with Python (Lab):130414

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Demonstrate** the use of loops & conditional statements in Python	Skill Development
2	**Design** Python programs to solve real world problem	Skill Development
3	**Prepare** technical report	Skill Development

List of Experiments

1. Introduction to Python programming
2. Write a program to create, concatenate and print a string and accessing substring from a given string
3. Write a program in Python for demonstration of list creation and its appending & removal
4. Write a program to demonstrate working with Tuples in python
5. Write a program to demonstrate working with Tuples in python
6. Write a code to create Functions in Python
7. Write a code to demonstrate the use of loops & conditions in Python
8. Write a code to take input from user & then to sort the numbers using Python
9. Write a python program to convert temperature units to and from degree Celsius to degree Fahrenheit
10. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order

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Renewable Energy Lab:130415

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Develop** the understanding of renewable energy sources.	Skill Development
2	**Investigate** the solar PV & wind energy operation and find their performance curves.	Skill Development
3	**Examine** smart house & load analysis kit.	Skill Development
4	**Develop** teamwork skills for working effectively in groups.	Skill Development
5	**Prepare a technical** report on experiments conducted in the lab.	Skill Development

List of Experiments

1. To setup a Solar PV standalone system and calculate power in different branches of the system.
2. To set up a Solar PV Grid Connected system and calculate power in different branches of the system.
3. To set up a Solar PV Power plant with the help of a Hybrid inverter.
4. To set up a Wind Energy standalone system and calculate power in different branches of the system.
5. To set up a Solar PV- Wind Energy Hybrid standalone system and calculate power in different branches of the system.
6. Utilizing smart house as a load and analyzing load waveforms.
7. Utilizing Load analysis kit and understanding about loads connected in series.
8. Observing different weather parameters using weather station.
9. Comparing the different types of grid connected systems and analyzing their waveforms with the help of linear loads.
10. Comparing the different types of grid connected systems and analyzing their waveforms with the help of nonlinear loads.