

**Scheme of Teaching and Examination for  
V Semester DIPLOMA in ELECTRICAL ENGINEERING**

**THEORY**

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME					
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Terminal Exam. (A) Marks	Final Exam. (B) Marks	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
1.	Installation Commissioning & Maintenance	20501	06	60	03	20	80	100	26	36
2.	Control System	20502	06	60	03	20	80	100	26	36
3.	Electrical Machine – II	20503	06	60	03	20	80	100	26	36
4.	Utilization of Electrical Energy	20504	06	60	03	20	80	100	26	36
5.	Power Electronics	20505	06	60	03	20	80	100	26	36
<b>Total:-</b>			<b>30</b>					<b>500</b>		

**PRACTICAL**

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION – SCHEME					
			Periods Per Week	Periods in one Session (Year)	Hours of Exam.	Marks Internal Exam. (A)	Marks External Exam. (B)	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
6.	Control System Lab.	20506	06	50	04	10	40	50	16	21
7.	Electrical Machine Lab.	20507	06	60	04	10	40	50	16	21
<b>Total:-</b>			<b>12</b>					<b>100</b>		

**SESSIONAL**

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME			
			Periods per Week	Periods in One Session (Year)	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject
8.	Electrical Measurement & Electrical Machine Lab.	20508	--	--	20	30	50	25
9.	In plant training and Visit to Work	20509	04 weeks continuous		40	60	100	50
<b>Total:-</b>							<b>150</b>	

<b>Total Periods per Week</b>	<b>42</b>	<b>Total Marks</b>	<b>750</b>
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## INSTALLATION COMMISSIONING AND MAINTENANCE

<b>Subject Code</b> <b>20501</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### Rationale :

Electrical Diploma holders are expected to get employment in industries (large, medium or small), Electricity Board, Loco Traction etc. As per prerequisite of such industries the Electrical Diploma Holder must have a knowledge of Installing:-

- (a) various electrical machines,
- (b) over head transmission and distribution lines
- (c) the various relay and protective equipments
- (d) the starting and control gears,
- (e) various Transformers and circuit Breakers,
- (f) The various measuring and recording systems,
- (g) bus bars, panels incoming and outgoing feeders,
- (h) interconnecting grid stations,
- (i) the various electrically operated group and Batch drives of the industries.

The knowledge of proper layout or required items in the system is also essential. Such technicians should also have skill to maintain the above mentioned items properly and regularly to make the system more efficient and reliable and thus increasing the life of the system as a whole.

Such technicians do, also, require to have skill of locating and rectifying electrical faults in the system (where ever arises) very quickly and with an exactness.

To achieve the above skill a proper study of aspects of Installation and maintenance is essential. A proper testing knowledge of the reliable Installation before commissioning is the prime requirement. These Diploma Holders should have environment consciousness and a skill to orient the jobs in a most efficient way with economy of time and money.

During the Part-I and Part-II stage of their studies, the students of electrical Disciplines have learnt about the working principle, construction, starting and control, regulation etc. of various m/cs. They have to study about Generation, Transmission and Distribution system in Part-III stage itself.

In view of the above this paper includes only the topics regarding Installation, Commissioning and Maintenance.

### Objective:

As per the technicians, profile available from Bihar Electricity Board, Electrical Equipment Factory and other, like industries, electrical Technicians or J.E. Electrical are the back-bone for having the say in reliable and efficient performance of electrical system. Such technicians must have the capability of supervising

- (a) the work of Installation of Electrical system,
- (b) the essential tests and examination of various electrical system before commissioning,
- (c) the relevant periodical maintenance of electrical installation as required under I.S.I.(B.I.S.) Codes or as per requirement of industry,
- (d) Calibrating and correcting the measuring instruments, relays and other fault finding equipments at the time of requirements.

With the above ideas the topics and sub-topics of the syllabus concerned are given below:-

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Installation	(20)
02	Commissioning	(20)
03	Maintenance	(20)
<b>Total :</b>		<b>(60)</b>

**CONTENTS:**

**TOPIC: 01 – INSTALLATION:**

[20]

Introduction of Installation, Necessity and types of Installation, Installation of static machine (for example Transformer on ground or working floor) Installation of earthing, Necessity of foundation, Factors governing choice of foundation, Process of laying foundation. Fixing of base, Vibration and its minimization, General study of different types of electrical drives. Magnetic Couplings, Alignment and Testing of Alignment. Introduction of Lubricants.

**TOPIC: 02 –COMMISSIONING:**

[20]

Introduction of Commissioning, Commissioning of a Transformer, Commissioning of an Alternator, Commissioning of an Induction motor, Commissioning of a D. C. machine, Testing of Transformer oil. Testing in terms of break down voltage.

**TOPIC: 03– MAINTENANCE:**

[20]

Introduction of maintenance, Importance of maintenance, Types of maintenance, Maintenance of ceiling and Table fan, Maintenance of Electric Iron, Maintenance of Toaster, Maintenance schedule for preventive maintenance of different capacities transformers, Maintenance of Relay, Maintenance of Transmission line, Maintenance of hot plate and heater.

**Books Recommended:**

1. Fundamentals of Maintenance of Electrical Equipment, - B. B. Bhaba  
Khanna Publishers
2. Maintenance of Electrical Equipment - P. P. Gupta
3. A Text book of Electrical Technology - B. L. Theraja
4. Electrical Power(Hindi) - D. R. Nagpal
5. oS|qr laLFkkiu] vkdyu ,oa ewY;kadu] Asian - Tara Dutt  
Publishers
6. oS|qr laLFkkiu] vkdyu ,oa ykxr] Nav Bharat - Jaggi  
Prakashan, Meerut

# CONTROL SYSTEM

<b>Subject Code 20502</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>		
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>100</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>80</b>
					<b>20</b>	

## Rationale and Objective:

The measuring instruments and instrumentation require various forms of control when put to services as per requirements of the industries. The technicians must have the proper knowledge of control system.

With the knowledge of control system components, such technicians should, also, have the knowledge of time domain analysis of system, concept of stabilising as well as frequency response of the system. With these objectives the topics are spread in scientific manner.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Laplace Transform	(05)
02	Introduction to control system using 'S' Plan	(03)
03	System and Transfer Function	(08)
04	Control System Components	(10)
05	Time domain analysis of a system	(07)
06	Concept of stability	(05)
07	Frequency response	(08)
08	Nyquist stability criterion	(08)
09	Introduction to state space approach	(06)
<b>Total :</b>		<b>(60)</b>

## CONTENTS:

### **TOPIC: 01 – LAPLACE TRANSFORM :** **[05]**

01.01 Introduction to Laplace transform, Simple RL, RC and RLC Ckt, analysis and Laplace and inverse Laplace transform. (05)

### **TOPIC: 02 –INTRODUCTION TO CONTROL SYSTEM USING 'S' PLAN:** **[03]**

02.01 Open loop and closed loop control system with suitable Examples. (03)

### **TOPIC: 03 –SYSTEM AND TRANSFER FUNCTION:** **[08]**

03.01 Definition of Transfer Function; System Transfer Function of Single output system. (08)

### **TOPIC: 04 –CONTROL SYSTEM COMPONENTS:** **[10]**

04.01 Principle of working, Transfer Function and Application of following Components:- (02)

04.01.01 D. C. Servo motor, A. C. Servo Motor. (03)

04.02 A. C. Tacheometer, Amplidyne. (05)

### **TOPIC: 05 – TIME DOMAIN ANALYSIS OF A SYSTEM:** **[07]**

05.01 Standard tests signals used, concepts of impulse response, Response of first and second order system to step input. Time response specifications along with derivations. (07)

**TOPIC: 06 –CONCEPT OF STABILITY:** [05]

06.01 Definition of stable unstable limitedly stable systems, Response terms for various natures of roots, Relative stability. Rouths stability criterion. (05)

**TOPIC: 07 –FREQUENCY RESPONSE:** [08]

07.01 Introduction. (03)

07.02 Correlation between time response and frequency. (03)

07.03 Polar plots of different types of transfer function. (02)

**TOPIC: 08 –NYQUIST STABILITY CRITERION:** [08]

08.01 Nyquist stability criterion. (03)

08.02 Application of this criterion. (05)

**Books Recommended:**

1. Control System Engineering - Nagarath & Gopal
2. Control System Engineering - Sushil Das Gupta
3. Control System Components - B. Chattarjee
4. Control System - Ogata

## ELECTRICAL MACHINE - II

<b>Subject Code</b> <b>20503</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### Rationale :

In the present era, the students, after passing Diploma in Electrical Engineering, will be employed in different industries, board and railways etc., where they will have to deal with the generations, utilization, maintenance and repair of different types of machines. It is, therefore, very essential to impart the knowledge of electrical machines in details, to the students for successfully discharging their duties.

### Objective:

The proposed syllabus of Electrical Machine-II includes the relevant topics with objectives of building up the skill of the students. This will enable them to face the situation successfully when attached with responsibility.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Transformer	(12)
02	Induction Motor	(15)
03	Alternators	(15)
04	Synchronous Motor	(10)
05	Special Motors & Induction Regulator	(08)
<b>Total :</b>		<b>(60)</b>

### CONTENTS:

#### **TOPIC: 01 –TRANSFORMER:**

[12]

- 01.01 Working Principle and construction of transformer. Circuit and its efficiency.
- 01.02 Open Circuit test and Short Circuit test. Rating and Regulation of a 1- $\phi$  transformer.
- 01.03 Losses in a transformer. Efficiency of a transformer, variation of  $\eta$  with Power factor, All day efficiency of a transformer.
- 01.04 Parallel operation of 1- $\phi$  & 3- $\phi$  transformers.
- 01.05 Schott Connection
- 01.06 Auto-transformer (Descriptive Study only)
- 01.07 Cooling of Transformer.

#### **TOPIC: 02 –INDUCTION MOTOR:**

[15]

- 02.01 General Principle of Induction Motor, Rotor Reactance, EMF Current and power factor under running condition.
- 02.02 Motor Characteristics: Torque slip curve, Torque- Rotational Speed curve, Torque-Speed characteristic under Load.
- 02.03 Starting: Condition of Starting an induction motor, D.O.L. Starter, Star delta Starter, Auto transformer Starter.
- 02.04 Speed Control: Various methods of speed control of 3- $\phi$  induction motors. By changing applied voltage/Applied frequency/Stator Poles.

**TOPIC: 03– ALTERNATORS:**

[15]

- 03.01 Construction & Basic Principle of Working of an Alternator.
- 03.02 Equation of induced emf, Alternator on load, armature leakage reactance, Voltage regulation, Losses in alternator, Efficiency of an alternator.
- 03.03 Characteristics: Open and Short Circuit characteristics.
- 03.04 Parallel operation of two alternators, Effect of an equal voltage on Parallel operation.
- 03.05 Methods of Cooling of alternators. (Descriptive study only)

**TOPIC: 04 – SYNCHRONOUS MOTOR :**

[10]

- 04.01 Principle of operation of synchronous motor
- 04.02 Methods of Starting of synchronous motor.
- 04.03 Different torque of synchronous motor -Starting Torque, Running Torque, Pull-in-Torque, Pull-out-Torque.
- 04.04 Comparison between Synchronous Motor and Induction Motor.

**TOPIC: 05 –:SPECIAL MOTORS**

[08]

- 05.01 Descriptive study of capacitor start motors, Shaded Pole motors, Universal motors, Schrage motor.

**Books Recommended:**

- 1. Theory of Alternating Current Machinery, TMH - S. Laugsdorf
- 2. Electrical Machinery, Khanna Publication - P. S. Bimvhra

**Reference Book :**

- 1. A Text Book of Electrical Technology (Vol-II) - B. L. Thereja

## UTILIZATION OF ELECTRICAL ENERGY

<b>Subject Code</b> <b>20504</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

**Rationale:**

Importance of Electrical Engineering is well known. This subject deals with utilization Electrical Energy at various level. Industrial application of electrical engineering and Traction of Locative have been dealt vigorously in this paper. Students reading this paper will be well versed in primary application of electrical power in industries.

**Objective:**

A diploma holder in Electrical Engineering who has read this paper will have confidence to understand the basic fact and utility of electrical power in industry. He can be a technician, supervisor or junior engineer or technical officer in any of industries Railways, Electricity Boards, Power Corporation at State and National level. He can a consultant or entrepreneur.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Electrical Heating	(12)
02	Electrical Welding	(08)
03	Illuminations	(10)
04	Industrial Control	(10)
05	Special Motors	(06)
06	Traction	(14)
<b>Total :</b>		<b>(60)</b>

**CONTENTS:**

**TOPIC: 01 –ELECTRICAL HEATINGS:** **[12]**

- 01.01 Electrical Heatings.
- 01.02 Resistance Oven.
- 01.03 Design of heating element and control and simple problems.
- 01.04 Induction heating.
- 01.05 Dielectric heating.

**TOPIC: 02 –ELECTRIC WELDING:** **[08]**

- 02.01 Resistance welding-Butt, spot.
- 02.02 Arc welding, carbon arc and Metallic arc weldings.



**TOPIC: 03– ILLUMINATIONS:** [10]

03.01 Incandescent Lamp, Fluorescent lamps. Arc Lamps, Discharge Lamps, sodium and Mercury vapor Lamps.

03.02 Glare and its minimization, use of reflectors, coefficient of utilization waste light factor.

03.03 Street Lighting, Flood Lighting

**TOPIC: 04 – INDUSTRIAL CONTROL:** [10]

04.01 Choice and use of A. C. And D. C. motors in different industries. Types of motors used for lifts, cranes and Rolling Mills.

04.02 Electric Braking: Plugging, Rheostatic braking, Regenerative braking.

**TOPIC: 05 –:SPECIAL MOTORS:** [06]

05.01 Single Phase Induction Motors, Capacitor Start and Capacitor run Motors, Shaded pole motors.

**TOPIC: 06 –TRACTION:** [14]

06.01 General features Requirement of an ideal traction system, system of Track electrification. ( Only Brief description )

06.02 Traction Motors: General features of traction motors, Application of different types of motors.

06.03 Track requirement and collection rail requirement over head equipment catenary construction.

**Books Recommended:**

1. Utilization of Electrical energy (in S. I. units) - C. L. Vadhwa
2. Electrical Utilization and Traction (in Hindi) - N. Basant & Yash
3. Utilization of Electrical Energy and Traction (in Hindi) - Harzai & Singh

**Reference Books :**

1. Fundamental of Electrical drive, Narosa Publishing House, New Delhi - G. K. Dubey
2. Electrical Technology, Mirja construction & Development, Rumnager, New Delhi - B. L. Theraja & A. N. Theraja

## POWER ELECTRONICS

<b>Subject Code</b> <b>20505</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### Rationale:

The courses is intended for man in electrical engineering technician training programme and people working in industries who want to up-grade their knowledge of electronics and electronics controlled circuits. The purpose is to enable the technicians to further advance their knowledge and acquaint them with day to day use of electronics in electrical control circuits.

### Objective:

The fast moving advancement in the field of electronics has given rise to prepare a Diploma holder with up- to-date control and working of different types of machines. The through knowledge of this paper will enable him to face and work on the current modern machines properly.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Circuit Devices	(15)
02	Applications of circuit Devices	(15)
03	Inverters and Choppers	(15)
04	Introduction to Electric Drive	(15)
<b>Total :</b>		<b>(60)</b>

### CONTENTS:

#### **TOPIC: 01 – CIRCUIT DEVICES:** [15]

Review of power electronics devices, Diodes, Power transistors, UJT (Uni Junction Transistor), Thyristors, operational amplifier. Ideal characteristics. Analog to Digital convertor.

#### **TOPIC: 02 –APPLICATIONS OF CIRCUIT DEVICES:** [15]

Introduction to switched mode power supply(SMPS), Static switches, Solid State relays, Wave generator.

#### **TOPIC: 03– INVERTERS AND CHOPPERS:** [15]

Pulse width Modulated Inverter, Single and three phase, A. C. voltage controllers, Switching functions of converters, Protection of devices, D. C. Choppers and control strategies. Introduction to U.P.S.

#### **TOPIC: 04 –INTRODUCTION TO ELECTRIC DRIVE:** [15]

Concept of D. C. Drives, Single-phase D. C. Drives, Chopper drives, Induction motor drives, Introduction to analog digital drive and its application.

**Books Recommended:**

1. An Introduction to Thyristor and their applications - M. Ramamoorthy
2. Integrated circuits and semi conductor devices theory and application - Gordon J. Deboo & Clifford N. Burrous
3. Power Electronics and Rotating Electric Devices - R. S. Ramshaw
4. Power Electronics - Dr. P. S. Bhimbhra
5. Solid State Electronics Devices, TMH -
6. Integrated Electronics, McGraw Hill - Milliman
7. Semi Conductor Devices - S. M. Sze, Willey Eastern
8. Electronics Device and Circuits, Khanna Publishers - G. K. Mithal
9. Electronic Principles, TMH - A. P. Malvino
10. Transistor Approximation, TMH - A. P. Malvino
11. Introduction to Micro Electronic Devices - Pulfrey
12. Micro Electronic Devices, McGraw Hill - Yang

## CONTROL SYSTEM LAB.

<b>Subject Code</b> <b>20506</b>	<b>Practical</b>			<b>No of Period in one session : 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>40</b>
	-	-	<b>06</b>	<b>Internal Exam.</b>	<b>:</b>	<b>10</b>

**Name of Experiments:**

- 01 Study of D. C. position control servomechanism system.
- 02 Study of Control System Components.
- 03 Transient Response of First Order System.
- 04 Transient Response of Second Order System.
- 05 Frequency Response of Second Order System.
- 06 ON-OFF temperature Control.
- 07 Analogue Computer, Solution of different equation.

## ELECTRICAL MACHINE LAB

<b>Subject Code 20507</b>	<b>Practical</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>		
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>50</b>
	-	-	<b>06</b>	<b>Internal Exam.</b>	<b>:</b>	<b>40</b>
					<b>10</b>	

**Rationale and Objectives:**

In Electrical Machine-II, the students have been imparted with the theoretical knowledge of different electrical machines. Keeping in view of practical knowledge the syllabus of Electrical Machine Lab has been preferred. So that it may bring boldness and confidence in the students regarding the actual working of Electrical machines.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Transformer	(20)
02	Induction Motor	(18)
03	Alternators	(14)
04	Synchronous Motor	(08)
<b>Total :</b>		<b>(60)</b>

**CONTENTS:**

**TOPIC: 01 –TRANSFORMER:** **[20]**

- 01.01 Determination of turn ration of a 1- $\phi$  transformer by voltage and current measurements.
- 01.02 Determination of percent efficiency regulation of a 1- $\phi$  transformer by performing open circuit and short circuit test.
- 01.03 Determination of percentage efficiency and regulation curve against increasing percentage output by performing load test on a 1- $\phi$  transformer.
- 01.04 Study of a 3- $\phi$  auto transformer and a 3- $\phi$  induction regulator.

**TOPIC: 02 –INDUCTION MOTOR:** **[18]**

- 02.01 Determination of Losses and efficiency of a 3- $\phi$  induction motor by performing no load test and blocked rotor test.
- 02.02 Determination of torque –slip characteristics of 3- $\phi$  induction motor by performing load test.
- 02.03 Study of D.O.L. Starter and Star-Delta Starter.
- 02.04 Study of Autotransformer Starter.

**TOPIC: 03– ALTERNATORS:** **[14]**

- 03.01 Determination of open circuit characteristics and short circuit characteristics.
- 03.02 Determination of losses and efficiency by performing load test on 3- $\phi$  alternator.

**TOPIC: 04 – SYNCHRONOUS MOTOR :** **[08]**

- 04.01 Determination of V-curve of a synchronous motor.
- 04.02 Study of a 3- $\phi$  synchronous capacitor

**Books Recommended:**

1. Lab manual on Electric Circuit, T.T.T.I., Madra -
2. Experiments in Electrical Engineering., Khanna Publication - G. P. Chalotra

**ELECTRICAL MEASUREMENT & ELECTRICAL MACHINE LAB**

	<b>Sessional</b>			<b>No of Period in one session :</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>		
				<b>:</b>		<b>50</b>

<b>Subject Code</b>	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>30</b>
	-	-	-	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

**20508**

**Rationale :**

The background of theoretical knowledge about Electrical instrument and m/c has been imparted in the theoretical papers.

However, the electrical Diploma Holders will require to handle various Electrical Instruments and m/cs in the field whenever they are given change of. So, it is necessary to acquaint the students with the practical aspects handling the Instruments & m/cs to increase their confidence and develop skill of level measurements, data entry, graph reading, analysis of the experimental results, etc.

**Objective:**

The coverage of syllabus is made in such a way that the students will get through knowledge of Handling the m/cs & Instruments. By performing such experiments they will gain confidence to face the problems and rectify they boldly. The students will develop skills of measuring taking data, their tabulations, plotting graphs, interpreting the data and the graphs to develop analytical skill.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Transformer	(20)
02	Induction Motor	(18)
03	Alternators	(14)
04	Synchronous Motor	(08)
<b>Total :</b>		<b>(60)</b>

**CONTENTS:**

**TOPIC: 01 –TRANSFORMER:** **[20]**

- 01.01 Determination of turn ration of a 1- $\phi$  transformer by voltage and current measurements.
- 01.02 Determination of percent efficiency regulation of a 1- $\phi$  transformer by performing open circuit and short circuit test.
- 01.03 Determination of percentage efficiency and regulation curve against increasing percentage output by performing load test on a 1- $\phi$  transformer.
- 01.04 Study of a 3- $\phi$  auto transformer and a 3- $\phi$  induction regulator.

**TOPIC: 02 –INDUCTION MOTOR:** **[18]**

- 02.01 Determination of Losses and efficiency of a 3- $\phi$  induction motor by performing no load test and blocked rotor test.
- 02.02 Determination of torque –slip characteristics of 3- $\phi$  induction motor by performing load test.
- 02.03 Study of D.O.L. Starter and Star-Delta Starter.
- 02.04 Study of Autotransformer Starter.

**TOPIC: 03– ALTERNATORS:**

[14]

03.01 Determination of open circuit characteristics and short circuit characteristics.

03.02 Determination of losses and efficiency by performing load test on 3- $\phi$  alternator.

**TOPIC: 04 – SYNCHRONOUS MOTOR :**

[08]

04.01 Determination of V-curve of a synchronous motor.

04.02 Study of a 3- $\phi$  synchronous capacitor

**Books Recommended:**

1. Lab manual on Electric Circuit, T.T.T.I., Madra -
2. Experiments in Electrical Engineering., Khanna Publication - G. P. Chalotra

**IN PLANT TRAINING AND VISIT TO WORK**

	<b>Sessional</b>	<b>No of Period in one session :</b>
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<b>Subject Code 20509</b>	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>60</b>
	<b>4 Weeks Continuous</b>			<b>Internal Exam.</b>	<b>:</b>	<b>40</b>

**Rationale:**

A student is required to develop his knowledge skill and attitudes gained while joining through different course. It is desirable to expose the students to the world of work to be familiar with the real life situations and understand the problem there in. The “In plant training and visit to work “being introduced for the final year part time diploma technicians for Electrical Engineering with the above objective in view. This course will help the students to observe how the technical, managerial, quality control safety and other principle are being applied in real life situation. They will be able to observe the technique of decision making on the shop floor. He will also, be able to observe the technique of decision making on the shop floor. He will, also be able to observe how his sub-ordinate perform in their day to day work and co-ordinate shop floor activities. The course will also, help bring attitudinal changes in a student.

**Objective:**

A student will be able to:

- Understand the working of the machines, tools and equipments more clearly.
- Write down the specifications of the machines, tools, equipments.
- Know the process of material storing / material management.
- Learn to maintain office records / filing.
- Know the process of planning, implementation and monitoring.
- Learn the skill shop floor co-ordination.
- Know the skill of office management and inventory Control.
- Understand the process of production.
- Know the skill of quality control.
- Know the organizational set-up and plant Lay-out.
- Locate the plants and industries related to Electrical Engineering State and Nation wise.
- Find out Characteristics, Functions, and activities of those industries.
- Find out opportunities and method of recruitments.
- Know the source of raw materials and markets for industries.
- Find out the special characteristics of the industries.
- Observe and understand special machines which they may not have been in their institutes.
- Observe the energy consumption in on industry method to same energy.
- Try to learn techniques to same energy.
- Observe the environment Pollutants and learn how to minimize environmental Pollution.

**CONTENTS**

An electrical engineering Diploma holders technician should preferably visit the following industries/works:

- Thermal Power Stations.
- Hydel Power Stations.
- Chemical Plant.
- Cement Plant.
- Steel Plant.
- Transmission/Distribution Power Stations.
- High Tension Insulator Factory.
- Electrical Equipment manufacturing factory.
- Any other factory of importance/relevance.



## REPORT WRITING:

A report should include the following:

<u>S.No.</u>	<u>Topics</u>
01	Introduction.
02	Name and types of Industries visited:- <ul style="list-style-type: none"><li>- Their specific characteristics</li><li>- Layout of the Plant</li><li>- Production/Generation capacity</li><li>- Production/Generation target for a year</li><li>- Actual Production/Generation</li><li>- Reason for shortfall</li><li>- Load factor in case of power generation.</li><li>- Lay out of 33 KV/132 KV/220 KV/400 KV</li><li>- Lay out of switchyard with specification of equipments</li><li>- Other points of relevance.</li></ul>
03	Working of different industries:- <ul style="list-style-type: none"><li>- Location</li><li>- Lay-out</li><li>- Raw materials(if any)<ul style="list-style-type: none"><li>(a) Their Availability</li><li>(b) Mode of raw materials</li><li>(c) Cost of raw materials</li></ul></li><li>- Product</li><li>- Organizational Structure</li><li>- Special Machine/Tools/Equipments</li></ul>
04	Conclusions <ul style="list-style-type: none"><li>- Observations</li><li>- Typical Characteristics</li><li>- Area of Weakness/Bottle necks/Materials</li><li>- Suggestions.</li></ul>

**The report on visit to works should be presented and assessed in the form of Seminar.**