

CURRICULUM FOR THREE YEAR
(SIX SEMESTER)
DIPLOMA COURSE IN

=====
:ELECTRICAL & ELECTRONICS ENGINEERING:
: Effective from Session :
=====

=====
:Semester System :
=====

Prepared By

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: Curriculum Development Cell :
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INSTITUTE OF RESEARCH DEVELOPMENT
& TRAINING, U.P., KANPUR

APPROVED BY

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: BOARD OF TECHNICAL EDUCATION :
: U.P. LUCKNOW, :
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STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN ELECTRICAL & ELECTRONICS ENGINEERING
(Effective From)

I Semester

Curriculum						Scheme of Examination									
Periods Per Week						Theory			Practical			Grand Total			
Le	Tut	Dr	Lab	Work	Tot	Examination	Sess.	Total	Examination	Sess.	Total				
c.	ori	aw	Shop	Shop	al	Dur.	Marks	Marks	Dur.	Marks	Marks	al			
5	-	-	3	-	8	1.1 Professional Communication	2.5	50	20	70	3	20	10	30	100
3	1	-	-	-	4	1.2 Applied Mathematics-I(A)	2.5	50	20	70	-	-	-	-	70
3	1	-	-	-	4	1.3 Applied Physics-I	2.5	50	20	70	-	-	-	-	70
5	-	-	-	-	5	1.4 Electrical & Electronics Engineering Material	2.5	50	20	70	-	-	-	-	70
4	2	-	6	-	12	1.5 Electronic Components And Devices.	2.5	50	20	70	3	80	40	120	190
-	-	14	-	-	14	1.6 Electrical & Electronics Engineering Drawing	3.0	50	20	70	-	-	-	-	70
20	4	14	9	-	47	<-----TOTAL----->	-	300	120	420	-	100	50	150	570
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)												25			
TOTAL												595			

I Semester

3	1	-	-	-	4	2.1 Applied Mathematics-I(B)	2.5	50	20	70	-	-	-	-	70
3	1	-	4	-	8	2.2 Applied Physics-II	2.5	50	20	70	3	40	20	60	130
5	1	-	3	-	9	2.3 Basic Electrical Engg. & Circuit Analysis	2.5	50	20	70	3	40	20	60	130
2	-	-	5	-	7	2.4 Introduction To Computer	-	-	-	-	3	60	30	90	90
-	-	-	-	12	12	2.5 Elementary Workshop Practice.	-	-	-	-	4	70	30	100	100
13	3	-	12	12	40	<-----TOTAL----->	-	150	60	210	-	210	100	310	520
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)												25			
TOTAL												545			

- NOTE:-
- (1) Each period will be of 50 minutes duration.
 - (2) Each session will be of 16 weeks.
 - (3) Effective teaching will be at least 14 weeks.
 - (4) Remaining periods will be utilised for revision etc.

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN ELECTRICAL & ELECTRONICS ENGINEERING
(Effective From)

III SEMESTER

Curriculum						S U B J E C T	Scheme of Examination								
Periods Per Week							Theory				Practical				Grand
Le c.	Tut ori al	Dr aw al	Lab	Work Shop	Tot al		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks	Total Marks		
5	2	--	--	--	7	3.1 Applied Mathematics-II	2.5	50	20	70	--	--	--	70	
6	--	--	6	--	12	3.2 Principles of Digital Electronics	2.5	50	20	70	3	40	20	60	
6	1	--	7	--	14	3.3 Electrical Machine	2.5	50	20	70	3	40	20	60	
5	1	--	--	4	10	3.4 Electrical & Electronics Measurements.	2.5	50	20	70	3	40	20	60	
--	--	--	--	3	3	3.5 Professional Communication Skills	--	--	--	--	--	40	40	40	
22	4	--	13	7	46	<-----TOTAL----->	--	200	80	280	--	120	100	220	
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)													25		
TOTAL													525		

IV SEMESTER

5	1	--	6	--	12	4.1 Networking & Programming in C & C++	2.5	50	20	70	3	70	30	100
5	1	--	--	--	6	4.2 Generation, Transmission & Distribution of Elect power	2.5	50	20	70	--	--	--	70
5	--	--	4	--	9	4.3 Communication Engineering	2.5	50	20	70	3	40	20	60
4	1	--	3	--	8	4.4 Power Electronics	2.5	50	20	70	3	35	15	50
--	--	--	--	6	6	4.5 Electrical & Electronics Minor Project	--	--	--	--	3	40	20	60
19	3	--	13	6	41	<-----TOTAL----->	--	200	80	280	--	185	85	270
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)													25	
TOTAL													575	

- NOTE:-
- (1) Each period will be of 50 minutes duration.
 - (2) Each session will be of 16 weeks.
 - (3) Effective teaching will be at least 14 weeks.
 - (4) Remaining periods will be utilised for revision etc.
 - (5) 4 weeks structured & supervised branch specific task oriented industry/field exposure to be organised during summer vacation.

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN ELECTRICAL & ELECTRONICS ENGINEERING
(Effective From)

V Semester

Curriculum						Scheme of Examination								
Periods Per Week						Theory				Practical				Grand Total
Lect.	Tutorial	Dr. aw	Lab	Work Shop	Total	Examination	Sess.	Total	Examination	Sess.	Total	Total		
al	al			al		Dur.	Marks	Marks	Dur.	Marks	Marks	Marks	al	
6	2	-	-	-	8	5.1 Industrial Management and Entrepreneurship Development	2.5	50	20	70	--	--	--	70
4	1	-	-	-	5	5.2 Switch Gear & Protection	2.5	50	20	70	-	--	--	70
6	2	-	8	-	16	5.3 Microprocessor And Application.	2.5	50	20	70	3	60	30	90
5	1	-	-	-	6	5.4 Control System	2.5	50	20	70	-	--	--	70
-	-	-	6	-	6	5.5 Electrical Drafting In AUTOCAD	-	--	--	--	3	60	30	90
21	6	-	14	-	41	<-----TOTAL----->	--	200	80	280	--	120	60	180
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)													25	
TOTAL													485	

VI Semester						Scheme of Examination								
Periods Per Week						Theory				Practical				Grand Total
Lect.	Tutorial	Dr. aw	Lab	Work Shop	Total	Examination	Sess.	Total	Examination	Sess.	Total	Total		
al	al			al		Dur.	Marks	Marks	Dur.	Marks	Marks	Marks	al	
4	-	-	-	-	4	6.1 Environmental Education & Disaster Management	2.5	50	--	--	--	--	--	
6	2	-	6	-	13	6.2 Industrial Drives & Control	2.5	50	20	70	3	60	30	160
-	-	-	6	-	6	6.3 Trouble Shooting And Servicing	-	--	--	--	3	60	30	90
-	-	-	-	-	-	6.4 ELECTIVE (Any One)	-	--	--	--	--	--	--	
5	1	-	-	-	6	A. Energy Management	2.5	50	20	70	-	--	--	70
5	1	-	-	-	6	B. Modern Communication System	2.5	50	20	70	-	--	--	70
5	1	-	-	-	6	C. Electric Traction	2.5	50	20	70	-	--	--	70
-	-	-	6	6	6	6.5 Project -i. Problem	--	--	--	--	3	100	50	150
-	-	-	-	-	-	ii. Field Exposure	--	--	--	--	-	40	20	60
25	5	-	12	6	48	<-----TOTAL----->	--	100	40	140	--	260	130	390
Games/NCC/Social and Cultural Activity/Community Development Work+ Discipline (15+10)													25	
TOTAL													555	

- NOTE:-
- | | | |
|---|---------------------------|------|
| (1) Each period will be of 50 minutes duration. | 30% Carry Over of I Year | 342 |
| (2) Each session will be of 16 weeks. | 70% Carry Over of II Year | 770 |
| (3) Effective teaching will be at least 14 weeks. | 100% of Final Year | 1040 |
| (4) Remaining periods will be utilised for revision etc. | | ---- |
| (5) Field visit and extension lectures are to be organised and managed well in advance at institute level as per need. | Grand Total | 2152 |
| (6) Field exposure will be treated as the part of project 40 marks will awarded on the basis of field exposure report and viva by project examiner. | | |
| (7) The exology and environment awareness (4 extension lectures). | | |
| (8) (*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks. | | |

MAIN FEATURES OF THE CURRICULUM

1. Title of the Course : Diploma In Electrical & Electronics Engineering
2. Duration of the Course : Three Years
3. Type of the Course : Full Time Institutional
4. Pattern of the Course : Semester System
5. Intake : 60
6. Entry Qualification : 10 Passed Minimum 35% Marks
7. Admission Criteria : State Joint Entrance Examination

On dated 03-01-13, 16-07-13 and 23-09-13 the following experts whose contribution and support in the development of the curriculum is a matter of obligation to I.R.D.T.

- | | | |
|-----|------------------------|---|
| 1. | Shri K. K. Singh Tomar | A.E., Panki Power House, Kanpur |
| 2. | Shri A. K. Dwivedi | Asstt. Prof., H.B.T.I., Kanpur |
| 3. | Shri P. K. Sachdeva | Retd. HOD(Electrical) |
| 4. | Shri Mohd Sabir | HOD(Electronics) G.P., Kanpur |
| 5. | Smt. Richa Verma | Sr. Lect., C.S.J.M. Univeristy,
Kanpur |
| 6. | Shri Neeraj Kumar | Lect. C.S.J.M. University,
Kanpur |
| 7. | Shri Jai Ram | HOD(Electrical), G.P., Kanpur |
| 8. | Shri Gopi Chand | HOD(Electronics), G.P., Barabanki |
| 9. | Shri Piyush Kumar | HOD(Electrical), G.P., Gonda |
| 10. | Shri D. K. Yadav | Lect(Electrical), G.P. Hardoi |
| 11. | Shri Mohd. Qamaruzzama | Lect. (English), G.P., Hamirpur |
| 12. | Shri Y.K.Sharma | Lect(Electronics), AIITH, Kanpur |
| 13. | Shri R. K. Srivastava | Lect(Electronics), G.P., Kanpur |
| 14. | Shri S. P. Srivastava | Lect(Electronics), G.P., Lucknow |
| 15. | Shri Deepak Srivastava | Programmer, G.P., Barabanki |
| 16. | Shri R. N. Rathore | Inst. (Drawing), G.P., Kanpur |
| 17. | Shri Mohd. Tariq | Dy. Director, IRDT, Kanpur |

The Following Experts provided their valuable suggestions -

- | | | |
|----|-----------------------|---|
| 1. | Shri Anwar Ali | Chief Electrical Engineer
Mirza International, Unnao |
| 2. | Shri Abhishek Swaroop | J.E. (C & I) Panki Power House,
Kanpur |

I Semester

1.1 PROFESSIONAL COMMUNICATION

[Common to All Engineering/Non Engineering Courses]

L	T	P
5	-	3

Rationale:

Communication forms an important activity of diploma holder. It is essential that he/she should be in a position to communicate in writing and orally with superiors, equals and subordinates. This subject aims at providing working knowledge of languages like Hindi and English so as to train the students in the art of communication. It is suggested that maximum attention should be given in developing Communication abilities in the students while imparting instructions by giving maximum emphasis on practice.

Sr.No.	Units	Coverage time		
		L	T	P
1.	Introduction to communication methods meaning, channels & media written and verbal.	5	-	-
2.	Development of comprehension of English & Hindi through study of text material & language exercises.	10	-	-
3.	Development of expression through A. Letters (English & Hindi) B. Report writing (English) Note making and minutes writing	10 10	-	-
4.	Paragraph writing, Essay writing, Proposal writing	10	-	-
5.	Composition	10	-	-
6.	Remedial Grammar & Vocabulary Building	15	-	-
		70	-	42

1. PART I : COMMUNICATION IN ENGLISH (40 Marks)

1.1 Concept of communication, importance of effective communication, types of communication, formal, informal, verbal and nonverbal, spoken and written. Techniques of communication, Listening, reading, writing and speaking, Barriers in communication, Modern tools of communication- Fax, e-mail, Telephone, telegram, etc.

1.2 Technical communication Vs. General Communication : Development of comprehension and knowledge of English through the study of text material and language exercises based on the prescribed text book of English.

1.3 Development of expression through:

1.3.1 Paragraph writing, Essay writing, Proposal writing.

1.3.2 Business and personal correspondence (Letters) :

Kinds of letters:-

Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters. Application for a job, Resume.

1.3.3 Report writing and Note making and minutes writing.

1.4 Functional Grammer : Study of sentences and parts of speech (word class), Preposition, Verb, Articles, Abbreviations.

1.5 Vocabulary Building : Homophones, One word substitution, Idioms and Phrases.

1.6 Composition on narrative, descriptive, imaginative, argumentative, discussion and factual topics.

2. PART II : COMMUNICATION IN HINDI (10 Marks)

2.1 Development of comprehension and knowledge of Hindi usage through rapid reading and language exercises based on prescribed text material developed by IRDT.

2.2 Development of expression through ;

Letter writing in Hindi:

Kinds of letters:-

Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters, Application for a job, Press release in Hindi, Report writing.

Note: Paper should be in two parts, part I - English and part II Hindi.

REFERENCE BOOKS

1. Bookshelf worksheet of Professional Communication, New Delhi : Bookshelf 2008
2. Functional Skills in language and literature by R. P. Singh, New Delhi : Oxford University Press.
3. Oxford English Hindi English Dictionary, New Delhi : Oxford 2008

LANGUAGE LAB PRACTICE

For the practice/exercise the following is suggested :-

- 1.A. Phonetic transcription
B. Stress and intonation :
(At least 10 word for writing and 10 word for pronunciation)
2. ASSIGNMENT : (Written Communication)

Two assignment of approximately 400 word each decided by the teacher concerned.

THE FOLLOWING MODEL IS PROPOSED :

1. a picture/photograph

2. an opening sentence or phrase
 3. a newspaper/magazine clipping or report
 4. factual writing which should be informative or argumentative.
- (The students may refer to "Bookshelf worksheet" for technical communication)

3. Oral Conversation:

1. Short speeches/declamation : Bid farewell, Felicitate somebody, Celebrate a public event, Offer condolences
2. Debate on current problems/topics
3. Mock Interview : Preparation, Unfolding of personality and Expressing ideas effectively
4. Group discussion on current topics/problems
5. Role Play/ general conversation : Making polite enquiries at Railway Station, Post Office, Banks and other Public places, Replying to such enquiries, enquiring about various goods sold in the market and discussing their prices. Complaining about service at Hotel, restaurant, Offering apologies in reply to such complaints, complain to a company about a defective product you have brought, reply to such complaints.
6. Presentation skill, Use of OHP and LCD.
7. Through drilling of model words involving different phonetic symbols (Vowels, Consonants, Diphthongs).

4. Aural :

Listening to conversation/talk/reading of short passage and then writing down the relevant or main points in the specified number of words and answering the given questions

The assignments/project work are to be evaluated by the internal/ external examiner. The distribution of 30 marks e.g.

10 marks for assignment (Given by subject teacher as sessional marks)

10 marks for conversation and viva-voce

10 marks for phonetic transcription

STRUCTURE OF THE PAPER OF PROFESSIONAL COMMUNICATION

Distribution of Marks

Theory Paper : 50 Marks

Sessional : 20 Marks

Practices : 30 Marks

- Q1. Question based on the topics of the prescribed syllabus will be set for testing candidates ability to understand the content, explain words and phrases, making sentence of given words and ability to summarise will be included. All questions will have to be answered.

A. from English Text Book 10 Marks

B. from Hindi Text Book 5 Marks

- Q2. Candidates will be required to write one letter (English)

and one letter in (Hindi) from a choice of two -

- A. English Letters 5 Marks
- B. Hindi Letters 5 Marks

Q3. Report Writing on given outlines 5 Marks

Q4. There will be a number of short answer questions to test the candidates knowledge of functional grammar, structure and usage of the language. All the items in this question will be compulsory. The grammar questions has four parts -

(Total Part: A For 5 Marks, B For 3 Marks, C For 3 Marks and D For 4 Marks)

A. This part of the question has to do with the transformation of sentences. English uses several patterns of sentence formation and the same meaning can be expressed by several patterns e.g. Active to Passive voice and vice versa, Direct to Indirect and vice versa, Reframing sentences by changing part of speech e.g. Noun to Adjective, Interchanging degree of comparison.

Interchanging Moods - Affirmative to Negative, Assertive to Interrogative or to exclamatory

B. The second part usually requires blanks in a sentence to be filled in with a suitable preposition and articles.

C. The third part is usually an exercise on tenses.

D. The fourth part concerns with one word substitution and abbreviation, uses of idioms and Phrases, Homophones.

Q5. COMPOSITION : (About 300 Words) (5 marks)

Candidates will be required to select one composition topic from a choice of five. The choice will normally include narrative descriptive, argumentative, discussion and factual topics. The main criteria by which the composition will be marked are as follows

A. the quality of the language employed, the range and appropriateness of vocabulary and sentence structure the correctness of grammatical construction, punctuation and spelling.

B. The degrees to which candidate have been successfully in organising both the composition as a whole and the individual paragraphs.

1.2 APPLIED MATHEMATICS I(A)
[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time		
		L	T	P
1.	Algebra- I	8	3	-
2.	Algebra- II	8	3	-
3.	Trigonometry	6	2	-
3.	Differential Calculus-I	10	3	-
4.	Integral Calculus-I	10	3	-
		42	14	-

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)
 - 1.1 Series : AP and GP; Sum, nth term, Mean
 - 1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.
 - 1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Cramer's rule
2. ALGEBRA-II:(10 Marks)
 - 2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.
 - 2.2 Complex number.

Complex numbers, Representation, Modulus and amplitude, De Moivre theorem, its application in solving algebraic equations, Mod. function and its properties..
3. TRIGONOMETRY :(8 Marks)
 - 3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I : (12 Marks)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.

5. INTEGRAL CALCULUS - I : (10 Marks)

Methods of Indefinite Integration :-

5.1 Integration by substitution.

5.2 Integration by rational function.

5.3 Integration by partial fraction.

5.4 Integration by parts.

1.3 APPLIED PHYSICS-I

[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Units & Dimensions	3	1	-
2.	Errors in Measurement	3	1	-
3.	Circular Motion	4	1	-
4.	Motion of Planets	4	1	-
5.	Dynamics of rigid body (Rotational Motion)	5	1	-
6.	Fluid Mechanics and Friction	4	1	-
7.	Friction	4	1	-
8.	Harmonic Motion	5	2	-
9.	Heat & Thermodynamics	6	4	-
10.	Acoustics	4	1	-
		42	14	-

DETAILED CONTENTS:

1. Units and Dimensions (4 Marks)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to:

- i) Checking the correctness of physical equations,
- ii) Deriving relations among various physical quantities,
- iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement (Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and

centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES :(5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kepler's Law, Escape and orbital velocity, Time period of satellite, Geostationary, Polar satellites (Concept Only)

5. Dynamics of Rigid Body (Rotational Motion) (6 Marks)

Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylinder), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane. Concept of Fly wheel.

6. Fluid Mechanics :(5 Marks)

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ($A_1V_1=A_2V_2$), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction :(4 Marks)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. Harmonic Motion (6 Marks)

Periodic Motion, characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat & Thermodynamics: (6 Marks)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. Acoustics (5 Marks)

Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

1.4 ELECTRICAL AND ELECTRONICS ENGG. MATERIALS
(Common With Diploma In Electrical Engineering)

L T P
5 - -

Rationale :

A diploma holder in electrical engineering will be involved in maintenance repair and production of electrical equipment and systems. In addition he may be required to procure, inspect and test electrical engineering materials. Knowledge of various types of materials will be needed in order to execute the above mentioned functions. He may also have to decide for an alternative when a particular material is either not readily available in the market or its cost becomes prohibitive.

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Classification	10	-	-
2.	Conducting materials	15	-	-
3.	Insulating materials	15	-	-
4.	Magnetic materials	10	-	-
5.	Semiconductor materials	10	-	-
6.	Special purpose materials	10	-	-
		70	-	-

DETAILED CONTENTS

1. Classification

Classification of materials into conducting, semiconducting and insulating materials with reference to their atomic structure.

2. Conducting Materials

- (i) Resistivity and factors affecting resistivity, such as temperature, alloying and mechanical stressing.
- (ii) Super conductivity and super conducting material.
- (iii) Low resistivity materials e.g. copper, aluminium and steel, their general properties as conductor e.g. resistivity, temperature co-efficient, mechanical properties, corrosion, solder ability, contact resistance and practical application. Uses of mercury as conducting material.
- (iv) Comparison of copper, aluminium and steel for various applications as electrical conductor.
- (v) Low resistivity copper alloys: brass, bronze (cadmium and beryllium), their practical application.
- (vi) High resistivity materials : manganin, constantan nichrome, carbon, tungsten, their practical applications.
- (vii) Electric lamp materials.

- (viii) Brush contact materials.
 - (ix) Soldering materials.
 - (x) Thermocouple materials, Fuse materials.
3. Insulating Materials
- (i) Introduction.
 - (ii) Properties of insulating material.
 - Electrical properties: Volume resistivity, Surface resistivity, Dielectric Loss, Dielectric Constant, Dielectric strength.
 - Mechanical properties:- Mechanical strength
 - Physical properties :- Hygroscopicity tensile and compressive strength, Abrasive resistance brittleness.
 - Thermal properties - Heat resistance, Classification according to high permissible temperature rise, Effect of over loading on the life of an electrical appliances, Increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity.
 - Chemical properties - Solubility, Chemical resistance, Weather ability.
 - (iii) Insulating materials and their application-
 - Definition and classification
 - Thermo setting materials e.g. Phenol Formaldehyde, Resins (i.e. Bakelite), Amino resins (Ureca formaldehyde and Malamine formaldehyde), Epoxy resins their properties, Applications and Commercial names.
 - Thermo Plastic materials e.g. Polyvinyl Chloride (P.V.C.), Poly Ethelene Silicons their properties application and commercial names. Brief description of extrusion and moulding process of using plastic materials in electrical engineering.
 - Natural Insulating Materials- Mica and Mica products, Asbestos and Asbestos products, Ceramic materials (Porcelain and Stealite), Glass and glass products, Cotton, Silk, Jute, Paper (Dry and impregnated), Rubber Butuman, Mineral and insulating oil for transformer, switch gear, capacitors, high voltage cables, insulating varnishes for coating and impregnation, Enamels for winding wires, Glass fibre sleeves
 - Gaseous Materials e.g. Air, Hydrogen, Nitrogen and SF6
4. Magnetic Materials :
- (i) Classification of magnetic materials into soft and hard magnetic materials.
 - (ii) Soft magnetic materials - high silicon alloy steel for transformers and low silicon alloy steel, for electric rotating machine cold rolled grain oriented and non-oriented steel, Nickel iron alloy, soft ferrites, their properties and uses.

- (iii) Hard magnetic materials - tungsten steel, chrome steel, cobalt steel, alnico, hard ferrites, their properties and applications.
- 5. Semiconductor Materials
Introduction, semiconductor and their applications, Different semiconductor materials used in manufacturing various semiconductor (Si & Ge), Material used for electronic components like resistor, capacitor, diode, transistors and inductors.
- 6. Special Purpose Materials :
Materials used in transistor and IC manufacturing, PC BS, computer memory devices (name of such materials to be added)
Ferrous and non ferrous materials.
Thermistor, Sensistor, Varistor and their practical applications.

1.5 ELECTRONIC COMPONENTS & DEVICES
(Common with Electronics Engineering)

L T P
4 2 6

RATIONALE

Knowledge of Electronic components & devices is quite essential for a student of electronics engineering diploma programme. With the knowledge of these active and passive components he will work successfully in every field of the branch. Therefore a diploma student in electronics engineering must be equipped with the fundamental knowledge about electronic components, voltage and current source, semi conductor diode, transistors, FET and integrated circuits for successful handling of industrial problems.

TOPIC WISE DISTRIBUTION OF PERIODS

Sr. No.	Units	Coverage Time		
		L	T	P
1.	Introduction To Electronics, Its Component and Decives, Its Application	4	2	-
2.	Passive Components	8	4	-
3.	Voltage & Current Source	4	2	-
4.	Semiconductor Diode	8	4	-
5.	Introduction To Bipolar Transistor	8	4	-
6.	Transistor Biasing & Stabilization	6	3	-
7.	Single Stage Transistor Amplifier	6	3	-
8.	Field Effect Transistor	4	2	-
9.	Metal Oxide Field Effect Transistor	4	2	-
10.	Complementary Metal Oxide Field Effect Transistor	4	2	-
Total		56	28	84

DETAILED CONTENTS

1. INTRODUCTION TO ELECTRONICS:
 - 1.1. Application of Electronics in different fields.
 - 1.2. Brief introduction to active components and devices.
2. PASSIVE COMPONENTS:
 - 2.1. Resister- Working characteristics/properties, Resistors- Carbon film, metal-film, carbon composition, wire wound and variable type (presets and potentiometers) constructional details, characteristics (size, voltage, tolerance temperature and frequency dependance and noise consideration, specification Testing, mutual comparison and typical applications, Voltage Dependent Resistor (VDR).
 - 2.2. Capacitors- Working characteristics/properties, Capacitors- polyster, Metallized polyster, ceramic paper mica and electrolytic tantalum and solid aluminium types; construction details and testing, specifications, mutual comparison & typical applications.
 - 2.3. Inductors, Transformers and RF coils- Working characteristics/properties

Methods of manufacture of inductors, RF coils and small power and AF transformer and their testing. Properties of cores.
Needs and type of shielding.

3. VOLTAGE AND CURRENT SOURCES:

- 3.1. Concept of constant voltage sources, symbol and graphical representation, characteristics of ideal and practical voltage sources.
- 3.2. Concept of constant current source, symbol and graphical representation, characteristics of ideal and practical current sources.
- 3.3. Conversion of voltage source into a current source and vice-versa
- 3.4 Concept of floating and grounded D.C. supplies.

4. SEMICONDUCTOR DIODE:

- 4.1. P-N junction diode, Mechanism of current flow in P-N junction drift and diffusion currents, depletion layer, potential barrier, P-N junction diode characteristics, zener & avalanche breakdown, concept of junction capacitance in forward & reverse bias conditions.
- 4.2. Semiconductor diode characteristics, dynamic resistance & their calculation from diode characteristics, dynamic resistance of diode in terms of diode current. Variation of leakage current and forward voltage with temperature (No devariation).
- 4.3. Diode (P-N junction) as rectifier, Half wave rectifier full wave rectifier including bridge rectifier, relationship between D.C. output voltage and A.C. input voltage rectification efficiency and ripple factor for rectifier circuits, filter circuits shunt capacitor, series inductor, capacitor input filter, bleeder resistance, working of the filters and typical applications of each type.
- 4.4. Different types of diodes, characteristics and typical application of power diodes, zener diodes, varactor diodes, point contact diodes, tunnel diodes, LED's and photo diodes.
- 4.5. Important specifications of rectifier diode and zener diode.

5. INTRODUCTION TO BIPOLAR TRANSISTOR:

- 5.1. Concept to bipolar transistor as a two junction three terminal device having two kinds of charge carriers, PNP and NPN transistors, their symbols and mechanisms of current flow, explanation of fundamental current relations. Concept of leakage current (ICBO) effect of temperature on leakage current.
Standard notation for current and voltage polarity.
- 5.2. CB, CE and CC configurations.
 - (a) Common base configuration (CB): inputs and output characteristics, determination of transistor parameters (input and output) dynamic resistance, current

amplification factor.

(b) Common emitter configuration: current relations in CE configuration, collector current in terms of base current and leakage current (I_{CEO}), relationship between the leakage current in CB and CE configuration, input and output characteristics, determination of dynamic input and output resistance and current amplification factor β from the characteristics.

(c) Common collector configuration: Expression for emitter current in terms of base current and leakage current in CC configuration.

5.3 Comparison of CB and CE configuration with regards to dynamic input and output resistance, current gain and leakage current performance of CE configuration for low frequency voltage amplification. Typical application of CB configuration in amplification.

5.4 Transistor as an amplifier in CE configuration.

(a) DC load line, its equation and drawing it on collector characteristics.

(b) Determination of small signal voltage and current gain of a basic transistor amplifier using CE output characteristic and DC load line, concept of power gain as a product of voltage gain and current gain.

6 TRANSISTOR BIASING AND STABILIZATION OF OPERATING POINT:

6.1 Different transistor biasing circuits for fixing the operating points, effect of temperature on operating point. Need and method for stabilization of operating point. Effect of fixing operating point in cut-off or saturation region on performance of amplifier.

6.2 Calculation of operating point for different biasing circuits, use of Thevenin's theorem in analysing potential divider biasing circuit.

6.3 Simple design problems on potential divider biasing circuit.

7 SINGLE STAGE TRANSISTOR AMPLIFIER:

7.1 Analysis of single stage CE, CB and CC amplifier.

7.2 Single stage CE amplifier circuits with proper biasing components.

7.3 AC load line and its use in :

(a) Calculation of current and voltage gain of a single-stage amplifier circuit.

(b) Explanation of phase reversal of the output voltage with respect to input voltage.

8. FIELD EFFECT TRANSISTOR (FET)

8.1 Construction, operation, characteristics and biasing of

Junction FET.

- 8.2 Analysis of Single Stage CS, CG and CD amplifiers. (Only Brief Idea)
- 9. MOSFET :
 - 9.1 Construction, operation, Characteristics and Biasing of MOSFET in both depletion and enhancement modes.
 - 9.2 Analysis of Single Stage CS, CG and CD amplifiers. (Only Brief Idea)
- 10. CMOS :
 - 10.1 Construction, operation and Characteristics of CMOS in both depletion and enhancement modes.
 - 10.2 Use of CMOS as Invertor, Different application of CMOS, CMOS IC.
 - 10.3 Comparison of JEET, MOSFET and Bipolar transistor.

LIST OF BOOKS

- 1. Bhargava, Kulshreshtha & Gupta - "Baisc Electronics & Linear Circuits" - Tata Mcgraw-Hill.
- 2. Malvino, A. P. - "Electrinics Principles" - Tata Mcgraw-Hill.
- 3. Sedra, Adel S. Smith, Kenneth. C. " Micro Electronics Circuits" - Oxford University Press 5th Edtion
- 4. Sombir Sing - Electronic Components Devices- Jai Prakesh Nath Publication Meerut

ELECTRONIC COMPONENTS & DEVICES

LIST OF PRACTICALS

1. Semiconductor diode characteristics :
 - (i) Identifications of types of packages, terminals and noting different ratings using data books for various types of semiconductor diodes (Germanium, point contact, silicon low power and high power and switching diode).
 - (ii) Plotting of forward V-I characteristics for a point contact and junction P-N diode (Silicon & Germanium diode).
2. Rectifier circuits using semiconductor diode, measurement of input and output voltage and plotting of input and output wave shapes
 - (i) Half wave rectifier.
 - (ii) Full wave rectifier (centre tapped and bridge rectifier circuits)
3. To Plot forward and reverse V-I characteristics for a zener diode.
4. To Plot wave shapes of a full wave rectifier with shunt capacitor, series inductor and n filter circuit.
5. To Plot the input and output characteristics and calculation of parameters of a transistor in common base configuration.
6. To Plot input and output characteristics and calculation of parameters of a transistor in common emitter configuration
7. Transistor Biasing circuits
 - (i). Measurement of operating point (I_c & V_{ce}) for a fixed bias circuit.
 - (ii). Potential divider biasing circuits.
(Measurement can be made by changing the transistor in the circuits by another of a same type number.
8. Plot the FET characteristics and determination of its parameters from these characteristics.
9. Measurement of voltage gain and plotting of the frequency response curve of a JFET amplifier circuits.
10. Measurement of voltage gain and plotting of the frequency response curve of a MOSFET amplifier circuits.
11. Single stage Common Emitter Amplifier Circuits
 - (i). Measurement of voltage gain at 1 KHZ for different load resistance.
 - (ii) Plotting of frequency response of a single stage amplifier circuit.
 - (iii) Measurement of input and output impedance of the amplifier circuit.
12. Familiarization with lan instrument(Multimeter/CRO), etc.

1.6 ELECTRICAL & ELECTRONICS ENGINEERING DRAWING

L T P
- - 14

Rationale

Drawing, which is known as the language of engineers, is a widely used means of communication among the designers, engineers, technicians, draftmen and craftsmen in the industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. Thus, for the effective and efficient communication among all those involved in an industrial system, it becomes necessary that the personnel working in different capacities acquire appropriate skills in the use of this graphic language in varying degrees of proficiency in accordance with their job requirements.

Generally speaking, an engineering technician working at the middle level of the threetier technical manpower spectrum, is required to read and interpret the designs and drawings, provided to him by technologists and subsequently to translate them to the craftsmen for actual execution of the job.

This course in Engineering Drawing has been designed, keeping in view, the above referred job functions of a technician in the industry. This preliminary course aims at building a foundation for the further courses in drawing and other allied subjects. The contents of the course have been selected as to form a core for the various diversified fields of engineering. It is expected that at the end of this session, the students acquire sufficient skill drafting and some ability in spatial visualization of simple objects.

Sl.N.	Units	Coverage Time		
		L	T	P
Section A				
1.	Drawing Instruments and their use	-	-	8
2.	Lettering techniques	-	-	12
3.	Introduction to scales	-	-	16
4.	Conventional Presentation	-	-	12
5.	Principles of projections	-	-	16
6.	Point			
6.	Orthographic projection of simple orthographic Pictures	-	-	16
7.	Free Hand Sketching	-	-	12
Section B				
1.	Electrical & Electronic Symbols	-	-	14
2.	Active Devices & Telephone Components	-	-	12
3.	Wiring Diagram	-	-	16
4.	Rough Sketch of Circuit Diagram	-	-	16
5.	Conversion of Size (A1, A2, A3 & A4)	-	-	16
6.	Use of Various Graphers	-	-	16
7.	PCB Layout	-	-	16
		-	-	196

C O N T E N T S

NOTE : Latest Indian Standards Code of Practice to be followed.

1. Drawing, instruments and their uses. 1 Sheet

- 1.1 Introduction to various drawing, instruments.
1
- 1.2 Correct use and care of Instruments.
1.3 Sizes of drawing sheets and their layouts.
2. Lettering Techniques 2 Sheet
- Printing of vertical and inclined, normal single stroke capital letters.
- Printing of vertical and inclined normal single stroke numbers.
- Mini Drafter and their use.
3. Introduction to Scales 2 Sheet
- Necesssity and use, R F
- Types of scales used in general engineering drawing. Plane and diagonal scales.
4. Conventional Presentaion : 1 Sheet
- Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.
5. Principles of Projection 1 Sheet
- (a) Orthographic, Pictorial and perspective.
- Concept of horizontal and vertical planes.
- Difference between I and III angle projections.
- Dimensconing techniques.
- (b) Projections of points 1 Sheet
6. Orthographic Projections of Simple given orthographic pictures 2 Sheet
- Concept of sectioning
- Cases involving cutting plane parallel to one of the reference planes and prependicular to the others.
- Cases involving cutting plane perpendicular to one of the reference planes and inclind to the others plane, true shape of the section
7. Free hand sketching 1 Sheet
- Isometric views of simple job like carpentary joints, pipe & rod cutting section, Anvil, Swage Block, Vernier calipers, Trysquare, Step Pulley, Flonge coupling, etc

Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

Section B

1. ELECTRICAL & ELECTRONICS SYMBOLE :

1. Draw the standard symbols of the following :

(Different pages of ISI standard IS: 2032 may be referred):

- 1.1 (a) Resistors Capacitors: Fixed, preset, variable, electrolytic and ganged types.
- (b) Inductors : Fixed, tapped and variable types, RF & AF chokes, Air cored, Solid cored & laminated cored.
- (c) Transformers : Step-up, step-down. AF & RF types, Auto-transformer, IF transformer.
- (d) Electrical Symbols i.e Ammeter, Voltmeter, Wattmeter, Energy meter, Frequency Meter, Thermistor, Thermo couple.
- (e) Draw standard symbols of NOT, AND, NAND, OR, NOR XOR, Expandable & Tristate gates, Op, Amp, Ic, Flip-flops (Combination of 2,3,4 input gates should be drawn).

Antenna, Chassis, Earth, Loudspeaker, Microphone, Fuse Indicating lamp, Coaxial cable, Switches-double pole single throw (DPST), Double pole throw (DPT) and Rotary types, terminals and connection of conductors.

2. ACTIVE DEVICES AND TELEPHONE COMPONENT :

Semiconductor : Rectifier diode, Zener diode, Varactor diode, Tunnel diode, Photo, Light emitting diode (LED), Bipolar transistor, junction field effect transistor (JFET), Mosfet, Photo transistor, Uni junction transistor (UTJ), Silicon control rectifier (SCR), Diac, Triacs outlines (with their types numbers e.g TO3, TO5, TO18, TO39, TO65 etc) of the different types of semiconductor diodes, Transistors Scrs, Diacs, Triacs and ICs (along with indicators for pin identification etc.)

Telephone components :

Telephone Instrument/Components : Transmitter, Receiver, Filters & Hybrid transformer.

3. WIRING DIAGRAM

Connection wiring diagrams.

3.1 Point to point pictorial.

3.2 Highway or trunk line, Simple wiring diagram i.e. staircase wiring, wiring diagram of single bulb control, one bulb with one fan and one socket control, tube light connection diagram.

3.3 Base line or air line.

Exercise on reading & interpreting of wiring diagrams.

Graphical Representation of Data : Use of various graph paper and preparation of diagram from given data. Bar charts, pie graph, pictorial graph.

4. ROUGH SKETCH OF CIRCUIT DIAGRAM :

Draw the following circuit diagram : (With the help of rough sketch/clues given).

4.1 Circuit diagram of a Wein's bridge oscillator.

4.2 Circuit diagram of a Battery eliminator.

4.3 Circuit of Emergency light.

4.4 Circuit diagram of Voltage stabilizers.

4.4 Circuit diagram of Fan regulator.

5. CONVERSION OF SIZE (A1,A2,A3, AND A4) :

5.1 Given the block diagram of a radio receiver on A-4 size, enlarge the same to A-2 size.

5.2 Block of diagram of Electronic Multi Meter in A1-A3-A4.

5.3 Block diagram of a TV receiver in A-1/A-2 size, reduce it to A-3 size.

5.4 Convert a rough block diagram sketch on A-4 size to a finished block diagram on A-2 size.

6. PCB LAYOUT :

P.C.B layout of a single electronic circuit on a graph sheet. Keeping in view the actual size of the components.

NOTE :

A. The drawing should include dimension with tolerance wherever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure

II Semester

2.1 APPLIED MATHEMATICS I (B)
[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time		
		L	T	P
1.	Differential Calculus-II	12	4	-
2.	Integral Calculus-II	12	4	-
3.	Coordinate Geometry (2 Dimensional)	10	3	-
4.	Coordinate Geometry (3 Dimensional)	8	3	-
		42	14	-

DETAILED CONTENTS:

1. DIFFERENTIAL CALCULUS -II :(14 Marks)
 - 1.1 Higher order derivatives, Leibnitz theorem.
 - 1.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.
 - 1.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.
2. INTEGRAL CALCULUS -II :(14 Marks)
 - 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function of 1.2
 - 2.2 Simpsons 1/3rd and Simpsons 3/8th rule and Trapezoidal Rule : their application in simple cases.
3. CO-ORDINATE GEOMETRY (2 DIMENSION):(14 Marks)
 - 3.1 CIRCLE :

Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.
 - 3.2 Standard form and simple properties

Parabola $x^2=4ay$, $y^2=4ax$,

Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):(8 Marks)

4.1 Straight lines and planes in space -

Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),

4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz = d$ (Radius, Centre and General Equation)

2.2 APPLIED PHYSICS-II

[Common to All Engineering Courses]

L T P
3 2/2 4

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Optics	4	1	-
2.	Introduction To Fiber Optics	4	1	-
3.	Laser & its Application	4	1	-
4.	Electrostatics	4	1	-
5.	D.C. Circuits	4	1	-
6.	Magnetic Materials & Their Properties	4	1	-
7.	Semi Conductor Physics	4	1	-
8.	Introduction Diode & Transistors	4	2	-
9.	Introduction To Digital Electronics	4	2	-
10.	Non-conventional energy sources	6	3	-
		42	14	56

1. Optics (4 Marks)

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroids.

2. Introduction To Fibre Optics :(5 Marks)

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications (4 Marks)

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :(4 Marks)

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor, Energy of a charged capacitor, Effect of dielectric on capacitors.

5. D.C. Circuits (5 Marks)

Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties: (5 Marks)

Dia, Para and Ferro-magnetism, Ferrites, Magnatic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

Concept of Energy bands in soldis, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semi conductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transister : (6 Marks)

Majority and Minority charge carriers, P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics : (6 Marks)

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources: (7 Marks)

- (a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.
- (b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph T^2 versus l and using the formula $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E_1/E_2 of cells by potentiometer.
8. Determination of specific resistance by Carey Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

2.3 BASIC ELECTRICAL ENGINEERING & CIRCUIT ANALYSIS

L T P
5 1 3

Rationale

An electrical diploma holder is involved in various jobs ranging from preventive maintenance of machines to fault location in circuits, commission of new machines to selection of suitable apparatus, designing of small components for improvement. In order to carry out these and similar jobs effectively on any equipment circuitry or machinery, specialised knowledge of concerned field is essential.

However, for acquiring knowledge in any specialised field of electrical engineering, a group of certain common fundamental concepts, principles and laws involved and mastering of some manual skills are pre-requisites. To be covered in the subject of basic electricity.

Sl.N.	Units	Coverage Time		
		L	T	P
1.	Basic terminology and their concept	3	1	-
2.	Batteries	6	1	-
3.	Capacitors	6	1	-
4.	Electromagnetism	8	2	-
5.	Electromagnetic induction	12	2	-
6.	A.C. circuits	12	2	-
7.	Polyphase System	8	2	-
8.	D. C. Circuit	2	1	-
9.	Network Theorms	4	1	-
10.	Networks	9	1	-
		70	14	42

DETAILED CONTENTS

1. Basic Terminology and their concepts
 - 1.1 Current, EMF, potential difference (Voltage), resistance, resistivity their units conductors & insulators, Insulation resistance of a cable.
 - 1.2 Effect of temperature on the resistance of conductors, semiconductors (C, Si, Ge) and insulators physical explanation, temperature coefficient of resistance.
 - 1.3 Electrical power, energy and their units (SI), Heating effect of electric current and its practical examples.
 - 1.4 Relationship between electrical, mechanical and thermal SI units of work, power and energy, Electrical Safety and precautions.
2. Batteries
 - 2.1 Construction, chemical changes during charging and discharging of lead acid cells.
 - 2.2 Indications of a fully charged battery.

3. Capacitors
 - 3.1 Concept of capacitor, types of capacity of parallel plate capacitor, Composite capacitor and effect of physical parameters.
 - 3.1 Energy stored in a capacitor, dielectric and its influence on capacitance of a capacitor, dielectric constant dielectric breakdown and dielectric strength. Dielectric loss.
 - 3.3 Series and parallel combination of capacitors.
 - 3.3(a) Capacitance of multi-plate capacitors.
 - 3.4 Variable capacitors.
 - 3.5 Charging and discharging of capacitors.
 - 3.6 Simple problems on capacitors.
4. Electromagnetism
 - 4.1 Concept of magnetic flux, flux density, magnetic field intensity, permeability and their units.
 - 4.2 Magnetic circuits, concept of reluctance and mmf and simple problems.
 - 4.3 Analogy between electric and magnetic circuits.
 - 4.4 B-H curve and magnetic hysteresis (No mathematical derivation).
 - 4.5 Elementary ideas about hysteresis loss.
5. Electromagnetic Induction
 - 5.1 Faraday's laws of electromagnetic induction. Lenz's law, simple problem. Dynamically induced emf.
 - 5.2 Self induced emf, inductance, its role in electrical circuits. Simple problems.
 - 5.3 Mutually induced emf, mutual inductance, its role in electrical circuits. Simple problems.
 - 5.4 Energy stored in magnetic circuit.
 - 5.5 Rise and decay of current in inductors.
 - 5.6 Force on a current carrying conductor placed in a magnetic field and its applications.
 - 5.7 Elementary idea about eddy current loss.
6. A.C. Circuits
 - 6.1 Recapitulation of terminology, instantaneous value, maximum (peak) value, cycle, frequency, alternate current and voltage. Difference between AC and DC.
 - 6.2 Equation of an alternating voltage and current and wave shape varying sinusoidally.
 - 6.3 Average and RMS value of alternating voltage and current. Importance of RMS value. Simple problems.

- 6.4 Concept of phase, phase difference and phasor representation of alternating voltage and current.
 - 6.5. A.C. through pure resistance, inductance, capacitance, phasor diagram and power absorbed.
 - 6.6 R-L series circuit, idea of impedance and calculations.
 - 6.7 Apparent power, reactive power and active power, power factor, its importance and simple problems.
 - 6.8 R-C series circuit , simple problems.
 - 6.9 R-L-C series circuit , simple problems.
 - 6.10 Solution of simple parallel A-C circuits by
 - (a) Phasor diagram method,
 - (b) Admittance method.
 - 6.11 Solution of AC circuits series/parallel by j method. (simple problems).
 - 6.12 Resonance (Series and parallel) and practical application, simple problems.
 - 6.13 Basic circuit analysis through first and second order differential equation and laplas transform.
7. Polyphase System
- 7.1 Introduction to polyphase system. Advantage of three phase system over single phase system.
 - 7.2 Star and Delta connections. Relationship between phase and line value of currents and voltage. Power in polyphase circuits. Simple problems of balanced circuits only.
8. D. C. CIRCUIT
- Kirchoff's Law- Simple numerical problems based on Kirchoff's Law.
9. NETWORK THEOREMS:
- Review of the following, network theorem: superposition, Thevenin's Norton's and maximum power transfer.
10. NETWORKS:
- 1 One Port Network : Series and parallel tuned circuit, expression for their impedance at any frequency and at resonance in terms of Q and component values (L. C. & R). Band width of tuned circuit in terms of resonance frequency and Q.
 - 2 Two Port (Four Terminals Networks : Basic concept of the following terms :
 - (a) Symmetrical and asymmetrical networks.

- (b) Balanced and unbalance network,
- (c) T-network, Ladder network, Lattice network, L Network, Bridge T-network.
- (d) Representation of a two port " Block Box" in terms of Z, Y and H parameters and mention of application to transistor as a two port network.

LIST OF BOOKS

1. J. P. Ryder- Network Filters & Transmission Line- PHI
2. A. Chakravorty- An Introduction to Network, Filters & Transmission Line- Dhanpat Rai & Co.
3. D. R. Chaudhry- Network Analysis- Dhanpat Rai & Co.
4. V. K. Aatre- Network Theory & Filter Design- New Age International Pub.

BASIC ELECTRICAL ENGG. & CIRCUIT ANALYSIS LAB

1. To show the variation of resistance of a lamp with temperature by plotting a V-I curve for 60W and 100W filament lamps.
2. To verify the Kirchoff's laws.
3. Experimental verifications of the Thevenin's and Norton's theorm with an a.c. source.
4. Experimental varifications maximum power transfer theorm.
5. To observe the B-H curve for a ferro-magnetic core on CRO.
6. To find the relationship between voltage and current for R-L series circuit for variable resistances & variable inductance.
7. To determine the variation in the values of inductance of a coil for different positions of the movable iron core.
8. To measure the power factor in a single phase AC circuit by using voltameter, ammeter & wattmeter.
9. To test a battery for charged and discharged condition and to charge a battery.
10. Verification of voltage and current relations in Star and delta connected systems.
11. Verification of laws of capacitors in series and parallel.

2.4 INTRODUCTION TO COMPUTER

[Common with Civil Engg., Civil (Spl. With Rural), Mechanical Engg., (Specialisation in Production, Automobile, Refrigeration and Air conditioning), Electronics Engg., Instrumentation and Control Engg., Dairy Engg., Leather Technology, Footwear and Leather Goods Tech., Ceramics, Chemical Engg. (Four year Sandwich), Chemical Tech. (Rubber & Plastic), Chemical Tech. (Fertilizer)]

L T P
2 - 5

Rationale:

Computers are being used for design and information processing in all branches of engineering. An exposure to fundamentals of computer programming is very essential for all diploma holders. This subject has been included to introduce students in the use and application of computers in engineering.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction to Computer	4	-	-
2.	Introduction To Operating System (MS DOS/Windows)	3	-	-
3.	Word Processing	4	-	-
4.	Worksheet	4	-	-
5.	Presentation	4	-	-
6.	Data Base Operation	3	-	-
7.	Introduction to Internet	2	-	-
8.	Introduction to advance tools	4	-	-
		28	-	70

DETAILED CONTENTS

1. Introduction to Computer:
 - A. Block Diagram of Computer.
 - B. Types Of Computer
 - C. Types of Input and Output devices
 - D. Memories Devices (Its Types and Basic).
2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:)

What is operating system, its significance, Commands of DOS, Features/Application of window.
3. WORD PROCESSING:

File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup

Edit : Cut, Copy, Paste, Office Clipboard, Select All, Find, replace, Goto, etc.

View : Normal/Web Layout/Print Layout; Tool Bars; Header/Footer; Zoom, etc.

Insert: Break, Page Number, Date & Time, Symbol, Comment,

Reference, etc.

Format: Font, Paragraph, Bullets & Numbering, Borders & Shading, Column, Change case, Back ground, etc.

Tools : Spelling & Grammer, Language, Word Count, Letters & Mailing, Options, Customize, etc.

Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc.

Mail Merge

4. WORKSHEET:

Introduction, Use of Tools/Icons for preparing simple Mini Project.

5. PRESENTATION :

Introduction, Use of Tools/Icons for preparing simple presentation on Power Point.

6. DATABASE OPERATION :

Create database using MS Access, Create Table and Creating Reports.

7. Introduction to Internet:

What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails.

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.

A. Flow Chart

B. Algroithm

C. Programming

II. Use of advance Tools such as Skype, Teamviewer, Installation of Modem, use of WiFi, Etc.

INTRODUCTION TO COMPUTER LAB

List Of Practicals

1. Practice on utility commands in DOS.
2. Composing, Correcting, Formatting and Article (Letter/Essay/Report) on Word Processing tool Word and taking its print out.
3. Creating, editing, modifying tables in Database tool.
4. Creating labels, report, generation of simple forms in Database tool.
5. Creating simple spread sheet, using in built functions in Worksheet tool..
6. Creating simple presentation.
7. Creating mail ID, Checking mail box, sending/replying e-mails.
8. Surfing web sites, using search engines.

Note : In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/ MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/ Demonstration of project through Power Point Presentation.

2.5 ELEMENTARY WORKSHOP PRACTICS

(Common with Diploma in Electronics Engg. and Diploma In Instrumentation & Control Engineering)

L T P
- - 12

I- FITTING SHOP

Topic	Knowledge/Skill
1. Types and use of making and measuring tools including micrometer, slide callipers, vernier gauge, feeler gauge, spherometer.	Select and use correct tools to and measure as needed, Ability to measure wire and Sheet gauge, diameter, Radius dimension.
2. Types and use of vice, Clamps Chisel, Hammer, Punch for metal work.	Select and made correct use of appropriate tool for specified job.
3. Types and use of files for Soft and Hard metal/Alloys, Sheets.	Select and made correct use of files on specified materials.
4. Types and use of Grinding Machine, Grinding polishing Machine on Metals/Laminates.	Select and made correct use of appropriate machines and tools for specified grinding, buffing polishing operations.
5. Types and use of Hacksaw Power saw and Blades on soft and hard metals / Alloys / Laminates/Sheets.	Select and made correct use of appropriate saw and blade for specified job.
6. Types and use of Drilling Machine, Drill Bits, Drill Speeds, Including counter sinking on Metals, Alloys, Sheet Metal.	Select and made correct use of appropriate Drilling machine tools for Drilling and counter on specified job.
7. Types and use of Tapes and Dies for internal and external threading.	Select and made correct use of appropriate tools to cut specified job.
8. Types and use of fastening tools and accessories such as nuts, bolts, washers, self tapping, screws drivers, allen key, riveting tools and rivet for metal and sheet metal.	Select and made correct use of appropriate tools and fastening materials to carry out a fastening operation on specified job.
9. Techniques of Bending and Folding Aluminium pipes upto 12 mm. diameter. (Example Practice Antenna marking)	Ability to bend aluminium pipes of a given size to a specified job shape.

Jobs to be Made :

1. Hacksawing and Chipping of M.S.
2. Filing Chipped M.S job.
3. Fitting on rectangular or square M.S. job.
4. Making triangular square or Hexagonal figure inside of M.S. job.
5. Utility article to prepare calliper, screw driver or try square.

II-SHEET METAL SHOP

Topic	Knowledge/Skill
1. Types and use hand tools for sheet metal work cross pein, straight pein, ball pein mallet selection.	Select and make correct use of appropriate materials and tool for specified sheet metal job.
2. Types and use of hand shear quilltiness for sheet cutting.	Select and make correct use of appropriate tools/machine for cutting sheet metal specified dimensions.
3. Techniques of grooving creasing, folding, corner making, bending, circle cutting.	Ability to perform the specified operation on sheet metal to a given tolerance.
4. Types and use of engraving tools and machines or sheet metal.	Ability to engrave simple words on sheet metal.

Jobs to be Made :

1. (a) Cutting shearing & bending.
(b) Brazing practice on small pieces.
2. Making a soap case with M.S. sheet.
3. Making a funnel with tin sheet & soldering the same.
4. Making a cylinder & soldering the same.
5. Preparation of different types of joints such as Lap joint-single seam, Double seam & Cap joint & Hemp & Wired edge.

III-PAINTING SHOP

Topic	Knowledge/Skill
1. Techniques of sheet metal cleaning and surface treatment for spray painting.	Ability to prepare and treat surface appropriate before spray painting.
2. Types of paints, solvents, thinners, removers, brushes, use and care of brushes, paint preparation.	Ability to select and correctly use of appropriate paint remover, solvent, brush, ability to prepare paint and take care brushes.
3. Technique of spray painting and use of stencils on paint letters and figures on sheet metal.	Ability to spray paint on Sheet metal to a specified finish.

Job to be Made :

1. Preparation of wooden surface for paper basket or paper tray & painting & polishing the same.

2. To prepare a metal surface

IV-WOOD AND LAMINATE SHOP

Topic	Knowledge/Skill
1. Types important properties comparative costs of wood, plywood various particle board, veneers, formica, Bakelite, perspex and common amenities used for making Cabinets, Frames, consoles in the electronics field.	Identify commonly used materials state important properties, estimate cost. Select correct materials(s) for a given assignment.
2. Types important properties comparative cost use of covering materials such as artificial leather, Felt, Cloth, Frames, various types of Trims such as Aluminium strips channels corners grills.	Identify commonly used state important properties estimate cost, select correct materials (s) for the given assignment.
3. Types and use of planner, big saw, band saw, circular saw, various blades, Gullotine for Laminate and wood cutting, Necessary precautions.	Select and correctly use of appropriate Saw / Machine for wood, Laminate paring, cutting to specified shape and size.
4. Types and uses of hand saw, wood chisel, Wood files, Auger, Drill Counter, Sinking, sanding for woods and Laminates.	Select and correct use of appropriate tools for carrying out specified operation to a finish.
5. Techniques of fastening wood and laminates with nails, screws, adhesives.	Ability to fasten wood and laminates as specified.
6. Techniques of working on perspex-cutting shaping, Drilling, hole cutting joining with chloroform	Ability to cut, Join, Drill shape perspex to a given specification.
7. Techniques of fixing formica, venner, felt, artificial leather, rexin, foam, grills, trims on wood, chip board and laminates using adhesives, nails as required.	Ability to perform given fastening operation to given specification.
8. Techniques of engraving simple pattern, letters on bakelite, perspex, formica and similar.	Ability to engrave simple patterns and letters on laminates.

Jobs to be Made :

1. Plaining & Sawing Practice.
2. Lap joint.
3. Motric & Tenon joint.

4. Dovetial joing.

NOTES :

1. Each three period pratical session is to be precebed by one period tutorial session for demonstration/theory lessons.
2. Extensive use of illustrative display showing correct use, limitations precautions, properties (As applicable) of materials, tools, Machines should be used for teaching purpose. Teacher-student activity schedule should be prepared to ensure that the required knowledge / skill transfer takes place.

III SEMESTER

3.1 APPLIED MATHEMATICS II

[Common to All Engineering Courses]

L	T	P
5	2	-

Rationale :

The study of mathematics is an important requirement for the understanding and development of concepts of Engg. The purpose of teaching mathematics to the Diploma Engg. students is to give them basic foundation and understanding of mathematics so that they can use the same for the understanding of engineering subjects and their advancements.

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Matrices	16	6	-
2.	Differential Calculus	15	6	-
2.	Differential Equations	15	6	-
4.	Integral Calculus	12	5	-
5.	Probability & Statistics	12	5	-
		70	28	-

DETAILED CONTENTS

1. MATRICES :(12 Marks)

1.1 Algebra of Matrices, Inverse :

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermitian, Orthogonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

1.2 Elementary Row/Column Transformation :

Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix :

Linear dependence/independence of vectors, Definition and computation of a rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem :

Definition and evaluation of eigen values and eigen vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof) and its verification, Use in finding inverse and powers of a matrix.

2. DIFFERENTIAL CALCULUS :(10 Marks)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation :

Directional derivative, Gradient, Use of gradient f , Partial derivatives, Chain rule, Higher order derivatives, Eulens theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus :

Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION :(10 Marks)

3.1 Formation, Order, Degree, Types, Solution :

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, Nonlinear equation.

3.2 First Order Equations :

Variable seperable, equations reducible to seperable forms, Homogeneous equations, equations reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for $X=e^{ax}$, $\sin ax$, $\cos ax$, X^n , $e^{ax}V$, XV).

3.4 Simple Applications :

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. INTEGRAL CALCULUS - II: (12 Marks)

4.1 Beta and Gamma Functions :

Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series :

Fourier series of $f(x)$, $-n < x < n$, Odd and even function, Half range series.

4.3 Laplace Transform :

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations.

5. PROBABILITY AND STATISTICS :(6 Marks)

5.1 Probability :

Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution :

Discrete and continuous distribution, Binomial Distribution, Poisson Distribution, Normal Distribution..

3.2 PRINCIPLE OF DIGITAL ELECTRONICS

(Common with Electronics Engineering, Instrumentation & Control Engineering and Computer Engineering, Information Technology)

L T P
6 - 6

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
Part-1				
1.	Introduction	3	-	-
2.	Number System	6	-	-
3.	Codes, Code Conversion & Parity	3	-	-
4.	Logic Gates	9	-	-
5.	Logic simplifications	9	-	-
6.	Logic Families & Digital ICs	9	-	-
Part2- Combinational Logic Circuits				
7.	Arithmetic operations	6	-	-
8.	Encoder, Decoders & Display Devices Associated Circuits, Multiplexer & Demultiplexer	9	-	-
Part-3 Sequential Logic Circuits				
9.	Flip Flops	4	-	-
10.	Counters	6	-	-
11.	Shift Registers	4	-	-
Part-4				
12.	Memories	6	-	-
13.	A/D and D/A Converters	6	-	-
14.	Arthametic Circuits	4	-	-
		84	-	84

DETAILED CONTENTS

1. INTRODUCTION TO DIGITAL ELECTRONICS:
 - 1.1 Basic difference between analog and digital signal.
 - 1.2 Application and advantages of digital signal processing.
2. NUMBER SYSTEM:
 - 2.1 Binary, Octal and Hexadecimal number system; conversion from decimal octal and hexadecimal to binary and vice-versa.
 - 2.2 Binary addition, subtraction, multiplication and division including binary points.
 - 2.3 1's and 2's complements methoof subtraction.
3. CODES, CODE CONVERSION AND PARITY:
 - 3.1 The 8421 and excess-3 codes; mention of other populer BCD codes.
 - 3.2 Addition of 8421, BCD coded numbers its limitations and excess-3 coded numbers.

- 3.3 Gray code, Gray to binary conversion and vice-versa.
- 3.4 Basic concept of parity, single and double parity and error detection.
4. LOGIC GATES:
 - 4.1 Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates.
 - 4.2 Concept of negative and positive logic.
5. LOGIC SIMPLIFICATIONS
 - 5.1 Boolean algebra, Karnaugh-mapping (upto 4 variables) and simple application in developing combinational logic circuits.
 - 5.2 Implementation of logic equations with gates.
 - 5.3 Use of NAND and NOR gates as universal gates.
6. LOGIC FAMILIES AND DIGITAL ICs:
 - 6.1 Logic family classification :
 - (a) Definition of SSI, MSI, LSI, VLSI.
 - (b) Bipolar Logic, Diode Logic, Transistor Logic, Inverter, TTL logic, MOS, CMOS logic, logic ECL
 - (c) Sub-classification of TTL and MOS logic families.
 - (d) Characteristics of TTL and MOS Digital gates delay, speed of noise margin, logic levels, power dissipation, FAN-IN, FAN-OUT, power supply requirements and comparison between TTL and MOS ICs.
 - 6.2 Logic Circuits :
 - (a) Open collector and totem pole output circuit operation for a standard TTL, NAND gate.
 - (b) MOS circuit operation for a standard gate (NOR).
 - 6.3 Tristate Switch : Normally open and normally closed switch.
 - 6.4 Familiarisation with commercial digital IC gates, Their number identification and Pin configuration.
7. ARITHMETIC OPERATIONS:
 - 7.1 Design of Exclusive Or, Half adder and Half subtractor.
 - 7.2 Design of Full adder circuits and its operation.
 - 7.3 Design of Full subtractor circuits and its operation.
 - 7.4 Some examples (circuits) of code converters.
8. ENCODER, DECODERS & DISPLAY DEVICES ASSOCIATED CIRCUITS:

- 8.1 LED, LCD, seven segment display, basic operation of various commonly used types.
- 8.2 Four Decoder circuits for 7 segment display.
- 8.3 Basic decimal to BCD encoder circuits.
- 8.4 Use of decoders/driver ICs with reference to commercial ICs.
- 8.5 Basic Multiplexer and Demultiplexer
- 9. FLIP FLOPS:
 - 9.1 Operation using waveforms and truth tables of following flip flops.
RS, T, RST, D, JK, Master/Slave JK Flip Flops mention of commonly used ICs Flip flops.
- 10. COUNTERS:
 - 10.1 Counters classification.
 - 10.2 Binary and decade counters.
 - 10.3 Divide by N counters.
 - 10.4 Programmable asynchronous counters.
 - 10.5 Down counters up/down counter operations.
 - 10.6 Presetable asynchronous counters.
 - 10.7 Difference between asynchronous and synchronous counters.
 - 10.8 Ring counters with timing diagram.
 - 10.9 Familiarization with commercial TTL/CMOS counter ICs.
- 11. SHIFT REGISTERS:
 - 11.1 Introduction and Basic concepts including shift left and shift right.
 - 11.2 Serial in serial out.
 - Serial in parallel out.
 - Parallel in serial out.
 - Parallel in parallel out.
 - 11.3 Universal shift register.
 - 11.4 Familiarisation with common TTL/CMOS ICs.
 - 11.5 Buffer register, Tristate Buffer Register.
- 12. MEMORIES:
 - 12.1 Classification according to the following heads.
 - (a) Volatile and non-volatile memories.

- (b) Random access memories and sequential access.
 - (c) Semiconductor and non-semiconductor memories.
 - (d) Destructive and non-destructive memories.
- 12.2 Semi-conductor ROMs, PROMs, EPROM, SRAM, DRAM, Basic structure and working of CCD, R/W memory.
13. A/D AND D/A CONVERTERS:
- 13.1 Use of A/D and D/A converters.
 - 13.2 Binary resistor network R-2R network.
 - 13.3 D/A converter using R-2R.
 - 13.4 UP, UP/Down counter type A/D converter.
 - 13.5 Successive approximation.
 - 13.6 Basic concepts of parallel A/D converter.
 - 13.7 Two bit A/D converter.
14. ARITHMETIC CIRCUITS: Ideas About
- 14.1 Basic Arithmetic logic units applications.
 - 14.2 Block diagram explanation of binary multiplier circuit.

List of Books

1. Malvino & Leach- Digital Principles & Application- Mcgraw Hill- 5th Edition.
2. Mano, M. Morris- Digital Logic and Computer Design- Prentice Hall (India)

List Of Experiments

1. Do atleast 20 experiments familiarzation with bread-board.
Familiarzation With TTL And MOS ICs.
2. Identification of Ic-nos, Pin-nos, Ic types.
3. To observe that logic low and logic high do not have same voltage value in input and output of logic gate.
4. To observe the propagation delay of TTL logic gate.
5. Observation of the difference between MOS and TTL gates under the following heads
 - (a) Logic levels.
 - (b) Operating voltages.
 - (c) Propagation delay.Display Devices And Associated Circuits.
6. Familiarisation and use different types of LEDs common anode and common cathode seven segment display.
7. Use of 7447 BCD to 7-segment decoder.
Logic Gates.
8. Verification of truth table for 2 Input NOT, AND, OR, NAND, NOR, XOR Gates.
Design And Implementation Of Simple Logic Circuits.
9. To construct a 4-bit even/odd parity generator/checker using XOR gates and to verify their truth tables.
10. To construct half adder and half subtractor using XOR and NAND gates verification of their truth tables.
11. To construct a full adder circuit with XOR and NAND gates.
12. (a) Study of 3 bit adder circuit implemented with or and NAND gates.
(b) To construct 4 bit adder and full subtractor using full adder chip 7480 and NAND gates.
13. (a) To verify the truth table of 4 bit adder IC chip 7483.
(b) To construct the 4 bit adder/2's complement subtractor using 7483 and NAND gates.
Flip Flops.
14. To verify the truth table for selected positive edge

triggered and negative edge triggered F/F of J-K and D type.

Counters

15. To construct and verify truth table for asynchronous binary and decade using J-K flip flops.
16. (a) To construct divide by 60 counter using ripple.
(b) To use counter IC chip 7493 in the divide by eight mode and divide by sixteen mode.
(c) To construct a divide by 100 counter using CMOS.
17. To construct a divide by 60 counters using synchronous counter IC chips.

Registers.

18. To construct a 4 bit buffer register using 4 bit register IC chip.
19. To construct a 4 bit universal shift register using flip flops.
20. To use a 4035 B universal shift register.

Multiplexers And Demultiplexers.

21. To decode a 3 line to 8 line encode from 8 line to 3 line and to observe inputs and outputs.
22. Single plus to 16 line decoder and observation output after a 16 to 4 line encoder.
23. To use ALU chip for selected arithmetic and logic operations.

3.3 ELECTRICAL MACHINE

L T P
5 1 7

Rationale

Knowledge of various types of electrical machines including their performance characteristics is necessary to enable a diploma holder in electrical engineering to select, operate, maintain, test and repair/replace electrical machinery used in various industrial and domestic applications.

Knowledge of various parts and constructional details is also necessary when the diploma holder is placed in a manufacturing industry.

Thus to impart knowledge about the common types of electrical machines which a diploma holder deals with, are d.c. machines, transformers, synchronous machines, voltage regulator etc. Therefore these machines should be taught.

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Generalised Theory	8	2	-
2.	D.C. machines	12	2	-
3.	Transformer	12	2	-
4.	A. C. Generator	6	2	-
5.	Synchronous motor	8	2	-
6.	Induction motor	12	2	-
7.	Single Phase Induction Motor	12	2	-
		70	14	98

1. Generalised Theory of Electrical Machines:-
 - 1.1 Definitions of motor and generator.
 - 1.2 The principle of Electro Mechanical Energy Conversion.
 - 1.3 Elementary concept of generator and motor
2. D.C. Machines
 - 2.1 Construction of d.c. machines.
 - 2.2 E.M.F. equation
 - 2.3 Electromagnetic torque (torque equation)
 - 2.4 Principle of generating and motoring action.
 - 2.5 Speed and torque equation
 - 2.6 Armature reaction and commutation in d.c. m/cs.
 - 2.7 Factors controlling speed of d.c. motor.
 - 2.8 Speed control methods and starters for d.c. m/cs.
 - 2.9 Characteristics and application of D.C. generators and motors.
3. Transformer
 - 3.1 Classification, construction, principle and working of 1 ph. and 3 ph. transformer.
 - 3.2 E.M.F. equation.

- 3.3 Phasor diagram on no-load and load.
- 3.4 Transformer connections.
- 3.5 Losses and efficiency.
- 3.6 Voltage drops and regulation.
- 3.7 Connections for parallel operation.
- 3.8 Cooling
- 3.9 Testing of transformer as per IS specification (Type test and routine test, etc.)
- 3.10 Special transformer- Auto transformer, rectifier transformer, dry type transformer, furnace transformer earthing transformer, traction transformer and its use.
- 3.11 Welding transformer: constructional detail, comparison between power and welding transformer.

4. A. C. Generator (Alternator)

Working principle, construction, Full pitch and short pitch winding, pitch factor or coil span factor, distribution or winding factor, E.M.F. equation, rating of alternators, armature reaction, voltage drops in alternator, vector diagram of loaded alternator, voltage regulation and its determination, Efficiency of alternator, conditions for parallel operation, Methods of parallel operation, operation of alternators when connected to infinite bus bar.

5. Synchronous Motor

Construction, working principle, effect of load on synchronous motor, effect of change in excitation on the performance of synchronous motor, V curves, torque & mechanical power developed, condition for max. mechanical power, synchronous condenser, hunting and its elimination, comparison between ind. motor and synch. motor, starting methods and uses of synch. motor.

6. Induction Motor

- 1 Rotating magnetic field for 3 ph. concept of motors and its reversing.
- 2 Construction and working of 3 ph. induction motor (squirrel cage and wound rotor motor). Double squirrel cage induction motor.
- 3 Rotor frequency, rotor e.m.f., rotor current and rotor power factor.
- 4 Torque equation
- 5 Torque slip characteristics.
- 6 Principle and methods of speed control
- 7 Methods of starting of induction motor. On line, auto transformer, star delta manual/automatic starters for induction motor. Starter for slip ring ind. motor.
- 8 Application of induction motor .
- 9 Testing of motor as per I.S.

Performance of 3 phase induction motor with the help of circle diagram.

10. Losses and efficiency (simple problems only)

11. Phasor diagram of induction motor.

7. Single Phase Induction Motors

1. Classification of F.H.P. motors

2. Production of rotating Magnetic field in 1 ph. motors.

3. Double revolving field theory.

4. Construction working and application of

(i) Capacitor motor (all types)

(ii) Shaded pole motor

(iii) 1 ph. synchronous motor

(iv) 1 ph. series and universal motor

(v) Servo Motor

ELECTRICAL MACHINE LAB

1. Measurement of induced emf and magnetising current under open circuit condition in D.C. generators.
2. Determination of the relationship between terminal voltage and load current keeping speed constant for
 - (a) Separately excited generator keeping excitation constant
 - (b) D.C. shunt generator.
3. To measure the variation in no load speed of a separately excited d.c. motor for the variation in
 - (a) Armature circuit resistance
 - (b) Field circuit resistance.
4. Measurement of the speed of a d.c. series motor as a function of the load torque.
5. (a) No-load and short circuit test on a single phase transformer.
(b) Determination of efficiency and regulation of transformer.
6. To determine performance characteristics of a polyphase induction motor. (load v/s efficiency, load v/s power factor, load v/s slip)
7. To start a 3 phase induction motor and to determine its slip at various loads.
8. To determine V curves of a synchronous motor.
9. To perform open circuit and block rotor test on a 3 ph. induction motor and to determine its efficiency.
10. To perform open circuit and short circuit test on a 3 ph. synchronous machine and to determine synchronous impedance and regulation at lagging/leading power factor.
11. Achieving high starting torque in case of 3 phase slip ring motor by increasing external resistance in rotor circuits and determine speed regulation at different loads

3.4 ELECTRICAL AND ELECTRONIC MEASUREMENTS

L T P
5 1 4

Rationale:

Diploma holding technician has to work on various jobs in field as well as in testing laboratories and on control panels, where he performs the duties of installation, operation, maintenance and testing of measuring instruments. Technician working on control panels in power plants, substations and in industries will come across by use of various types of instruments and has to take measurements.

Instruments used to read the general electrical quantities like current, voltage power, energy, frequency, and resistance have been incorporated in this subject. So the technician will know the construction and use of various types of instruments.

Sl.N.	Units	Coverage Time		
		L	T	P
1.	Introduction	4	1	-
2.	Measurements & errors	4	1	-
3.	Miscellaneous measuring instruments	8	2	-
4.	Elements of process instrumentation	10	2	-
5.	Electronic Multimeter	8	1	-
6.	Cathode Ray Oscillograph	10	2	-
7.	Audio Power Meter	4	1	-
8.	Impedance Bridges & Meters	10	2	-
9.	Digital Instrument	10	2	-
		70	14	56

DETAILED CONTENTS

- 1 Introduction to electrical measuring instruments:
 - 1.1 Concept of measurement and instruments.
 - 1.2 Electrical quantities and instruments for their measurements.
- 2.1 Measurement and Errors. Accuracy, precision, types of errors, probability of errors and Gaussian Errors curve, sensitivity, resolution and stability. Classification of errors.
- 2.2 Types of electrical measuring instruments, indicating, integrating and recording instruments.
- 2.3 Essentials of indicating instruments, deflecting, controlling and damping torques.
6. Miscellaneous Measuring Instruments:

The construction, working principle and application of: ohm-meter, meggar, earth tester, multimeter, frequency meter (reed-type) single phase power factor meter (Electrodynamometer type), 3-phase power factor meter, phase sequence indicator, synchronoscope.

4. Elements of Process Instrumentation
 - 4.1 Block diagram of process instrumentation system and purpose of each block.
 - 4.2 Basic principles of various sensors/transducers for measurement of temperature, pressure, strain and liquid level.
5. ELECTRONIC MULTIMETER:
 - 5.1 Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity, principles of voltage, current and resistance measurements.
 - 5.2 Specification of electronic multimeter and their significance.
6. CATHODE RAY OSCILLOSCOPE:
 - 6.1 Construction of CRT, Electron gun, Electrostatic focussing and acceleration (Explanation only-no mathematical treatment) Deflection sensitivity, Brief mention of screen phosphor for CRT. Internal Block Diagram of CRO.
 - 6.2 Explanation of time base operation and need for blanking during flyback, synchronisation.
 - 6.3 Block diagram and explanation of a basic CRO and a triggered sweep oscilloscope, front panel controls.
 - 6.4 Specifications of CRO and their significance.
 - 6.5 Use of CRO for the measurement of voltage (D.C. & A.C.) frequency using Lissajous figure, time period, phase.
 - 6.6 Special features of dual trace, delayed sweep and storage CROs (Brief mention only).
 - 6.7 Brief idea of Digital Storage Oscilloscope.
7. AUDIO POWER METER:
 - 7.1 Block diagram of an audio power meter.
 - 7.2 Principles of working its application and high frequency limitations.
 - 7.3 Scale conversion from power to db.
8. IMPEDANCE BRIDGES Q METERS:
 - 8.1 D.C. and A.C. Bridges :

D.C. bridges- Wheat stone bridge, Kelvins bridges, Sensitivity- Null indicators.

A. C. Bridges - Inductance bridges (Maxwell bridge), Capacitance bridges, Hays bridge, Anderson bridge, Schering bridge, Wein bridge, Twin network, Storage factor, Dissipation factor and their measurements.

- 8.2 Block diagram explanation and working principle of laboratory types (balancing type) RLC bridge. Specifications of a RLC bridge, Principle of digital RLC bridge.
- 8.2 Block diagram and working principles of a Q meter.
- 9. DIGITAL INSTRUMENTS:
 - 9.1 Comparison of Analog and Digital instruments, characteristics of digital meter.
 - 9.2 Working principle of Ramp, Dual slope and integrating type of digital voltmeter.
 - 9.3 Block diagram and working of a digital multimeter.
 - 9.4 Working principle of time interval frequency and period measurement using universal counter, frequency counter, time base stability and accuracy and resolution.

List of Books

- 1. A. K. Sawhney - A course in Electrical & Electronic Measurement & Instrumentation - Dhanpat Rai & Sons
- 2. Helfric & Cooper - Modern Electronic Instrumentation and Measurement Techniques- PHI

ELECTRICAL AND ELECTRONICS MEASUREMENT LAB

1. To extend the range of an ammeter/voltmeter.
2. To convert an ammeter into voltmeter.
3. To measure power, power factor in a 1-phase circuit using wattmeter and power factor meter and verify results with calculations.
4. Measurement of voltage, frequency of a sinusoidal signal with C.R.O.
5. Measurement of resistance, voltage, current with electronic multimeters (Analog & Digital) and compare the reading.
6. To calibrate three phase energy meter with the help of standard 3 phase energy meter.
7. Measurement of Q of a coil and its dependence on frequency using a Q meter.
8. To test a power supply for ripple, line and load regulation, Tracing of wave form, To findout operating range of power supply.
9. Measurement of distortion of a LF signal generator using distortion factor meter.
10. Measurement of R.L. and C using a LRC bridge/universal bridge.

3.5 PROFESSIONAL COMMUNICATION SKILLS

L T P
- - 3

1. EFFECTIVE VERBAL COMMUNICATION :
Improving voice and speech quality, Phonetics and Pronunciation improvement, Fluency building, Voice modulation technique, Understanding Foreign Accent.
2. SHORT SPEECHES AND DECLAMATION :
Bidding farewell, Felicitating somebody, Celebration a public event, Offerening condences, Expressing vote of thanks.
3. ARTICLE READING/DEBATE/GROUP DISCUSSION:
Article reading from books/magezine, One by one, Two by Two debate,Group discussion on different current topics/problems (National/international),
4. PRE DECLARED ACTIVITIES :
Selling demonstration, Speech delivery on any public issuse, Exhibition/Trade Fairs/Cultural Program, Managing Press Conference, Operation planning, Data Interpretations and analysis, Use of OHP and LCD Projector.
5. MOCK INTERVIEW :
Preparation, Unfolding of personality and expressing ideas effectively.
6. ROLE PLAY/ GENERAL CONVERSATION :
Making polite enquiries at Railway Station/Post Office/ Bank and other public places. Replying to such enquiries, Enquiring about various goods sold in the market and discussing their prices, Complaining about service at hotel and restaurent, Offering opologies in replay to such complaints, Complaing to a company about a defective product you have bought and replying to such complaints.
7. TELEPHONE SKILLS :
Telephone conversation (Book- Communication at work), How to tackle telephonic interview, Mock tele interview

L	T	P
5	1	6

Rationale :

For solution of different problems, C is a very powerful high level language. It is widely used in research and engineering problems. A software technician must be aware of this language for working in computer environment.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Concept of Programming	10	2	
2.	Programming in C	20	4	-
3.	Networking	20	4	
4.	Open source concept	10	2	
5.	IT Application	10	2	
		70	14	84

DETAILED CONTENTS

1. CONCEPT OF PROGRAMMING:

Concept of Flowcharting, algorithm, programming, Structured Programming Various techniques of programming, Use of programming.

2. Programming in C:

Data Types, Operators and Expressions; Input & Output printf, scanf, library Control Statement: IF- ELSE, While, For, Do- While, Switch; Functions and modular programming; Scope of variables, parameter passing, recursion, block structure; preprocessor statements; pointers and arrays; structures and unions; File handling.

3. NETWORKING :

What is network, need of network, terminology of network, network topologies, types of network, transmission media, network devices, network security.

4. OPEN SOURCE CONCEPT :

Open source based software, free software, types of standard, common open standard format.

5. IT APPLICATION :

Front and interface, back end database, front end and backend database connectivity, impact of ICT on society.

NETWORK AND PROGRAMMING IN C

List of Experiments

1. Exercises involving output and input format controls in Pascal.
2. Exercises involving control transfer statements in C
3. Exercises with arrays & Pointers in C.
4. Exercises with functions in C.
5. Exercises with files in C.
6. Making of straight and crosswire UTP cable
7. Study of modem, switch, hub.
8. Creation of LAN.

4.2 GENERATION, TRANSMISSION AND DISTRIBUTION OF ELECTRICAL POWER

L T P
5 1 -

Rationale :

The diploma holders have to perform variety of activities when employed in the State Electricity Board, N.T.P.C., N.H.P.C, N.P.C., etc. in the field of generation, transmission and distribution of the electrical power. The range of these activities varies from plant operation to maintenance and repairs of equipment, erection and maintenance of transmission and distribution schemes. Therefore, it is desirable that the adequate knowledge about various power plants transmission and distribution schemes be provided to these diploma holders. The students should be made aware of the recent developments, Current practices followed in the Electricity Boards to keep them abreast with the modern techniques in the field of generation, transmission and distribution of electrical power. The contents of this course have been selected considering all these factors in account.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Power Plants	22	2	-
2.	Non Conventional Power Generation	9	2	-
3.	Power Plant Economics	9	2	-
4.	Constructional Features of Transmission & Distribution Line	9	2	-
5.	Transmission System	9	2	-
6.	Distribution System	6	2	-
7.	Under Ground Cables	6	2	-
Total		70	14	-

DETAILED CONTENTS

1. POWER PLANTS :

(A) Thermal Power Plant :

Plant layout and working of various elements, fuel handling combustion, combustion equipment, Steam generation and its temperature and pressure, environmental pollution due to dust and ash, methods of dust collection, cooling of turbo-alternators.

(B) Hydro-Electric Power Plant :

Plant layout and working of various elements, Hydrology and hydrograph, flow duration curves, Types of hydrograph plants and their use, Water turbines, Automatic and remote control of power plants, ---- Head water control and Penstocks, Pumped storage plant.

(C) Nuclear Power Plant :
Plant layout and working of various elements. Fuels, Classification of nuclear power stations. Types of nuclear reactor, Coolants.

(D) Other Plants :
Plant layout and working of various elements of gas turbine plant, Open and closed cycle plants, Fuel and Fuel systems.

2. UNCONVENTIONAL POWER GENERATION :

Types of non-conventional energy resources, Solar cell and Solar power generation, Wind power generation, Role of unconventional power generation on rural socio-economic growth.

3. POWER PLANT ECONOMICS :

Load estimation, Load curves, Load and diversity factors, Demand factor, Plant capacity and utilization factors. Cost of generation and influence of load and diversity factors, Tariff and various methods of calculation, Bill preparation. Causes and effect of low power factor methods for improving power factor.

4. CONSTRUCTION FEATURES OF TRANSMISSION AND DISTRIBUTION LINES:

Constructional features of transmission and distribution lines. Types of supports, Types of conductors, Types of insulators. Erection of transmission towers and distribution poles. Fixing of insulators on conductors, testing, operation and maintenance of distribution lines. Testing of insulators, Voltage distribution of string insulators, Vibration dampers. Basic idea of Sag calculation.

5. TRANSMISSION SYSTEM :

Short, medium and long transmission lines. Parameters of lines. Performance of short lines (Regulation, Efficiency, Vector diagram). Corona formation and its effects on performance of lines.

Advantage of EHV transmission. Concept of HVDC transmission and its salient feature. Kelvin's law its limitations and utility.

Concepts of Grid and advantages.

6. DISTRIBUTION SYSTEM :

Feeders, distributors and service mains, radial and ring main distributors, A. C. distributors fed from one end and both ends (Simple problems on feeders and distributors).

7. UNDERGROUND CABLES :

H. T. and L. T. power cables construction, Cable joining, Laying of cables, Fault location, Murray loop test, Testing of cables, Comparison of underground cable with over head line.

4.3 COMMUNICATION ENGINEERING

L T P
5 - 4

Rationale :

Communication of signals at distant places plays an important role in modern industrial, commercial and scientific research organisations. A student having basic knowledge about the components of communication such as modulation, demodulation, transmitters, receivers and receiving elements will be useful for the industries.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction	2	-	-
2.	Amplitude Modulation	3	-	-
3.	Frequency Modulation	3	-	-
4.	Phase Modulation	8	-	-
5.	Principle of A.M. Modulators	8	-	-
6.	Principle of F.M. Modulators	8	-	-
7.	Demodulation of A.M. Waves	8	-	-
8.	Demodulation of F.M. Waves	8	-	-
9.	Transmitters	5	-	-
10.	Radio Receivers	5	-	-
11.	Antenna & Wave Propagation	12	-	-
		70	-	56

DETAILED CONTENTS

1. INTRODUCTION
 - 1.1 Brief idea of various types of communication system.
 - 1.2 Need of modulation and demodulation in communication system.
 - 1.3 Types of modulation-Brief description and typical application of AM, FM, phase modulation and pulse modulation (PAM, PPM and PCM).
2. AMPLITUDE MODULATION
 - 2.1 Derivation of expression for an amplitude modulated wave. Carrier and side bands, modulation index and depth of modulation.
 - 2.2 Relative power distribution in carrier and side bands.
 - 2.3 Elementary idea of DSB, DSB-SC, SSB, SSB-SC modulation and their comparison.
3. FREQUENCY MODULATION
 - 3.1 Derivation of an expression for frequency modulated wave and its frequency spectrum (without analysis of Bessel = function) Modulation index, Maximum frequency deviation and deviation ratio.
 - 3.2 Advantages and disadvantages of FM over AM in communication

systems based on consideration of band width requirement and noise.

4. PHASE MODULATION

Expression of phase modulated wave and its comparison with frequency modulation. (Brief introduction only)

5. PRINCIPLE OF AM MODULATORS

5.1 Working principles and typical application of

- Collector Modulator.
- Base Modulator.
- Balanced Modulator.

5.2 Single-Side-Band (SSB) generation and its typical applications.

6. PRINCIPLE OF FM MODULATORS

6.1 Working principle and applications of reactance tube modulator, varactor diode modulator and armstrong phase modulator.

6.2 Limiter, pre-emphasis and de-emphasis in FM communication system.

7. DEMODULATION OF AM WAVES

7.1 Principle of demodulation of AM wave using diode detector circuit; concept of diagonal clipping and formula for RC time constant for minimum distortion (No derivation).

7.2 Comparison of typical diode detector circuits in a Radio and TV receiver.

8. DEMODULATION OF FM WAVES

8.1 Basic principles of detection of FM waves.

8.2 Foster-seely discriminator and its working principles.

8.3 Working of Ratio-detector circuit and its advantage over Foster-seely discriminator circuits.

8.4 Basic principle of Quadrature detection.

9. TRANSMITTERS

9.1 Block diagram of an AM transmitters and working of each stage. Low level and High level modulation.

9.2 Block diagram and working principle of reactance tube and Armstrong FM transmitters.

10. RADIO RECEIVER

10.1 Brief description of crystal and TRF radio receivers; Need for and principles of superheterodyne radio receiver.

10.2 Block diagram of super-heterodyne AM receiver, function of

each block and typical waveforms at the input and output of each block.

10.3 Block diagram of an FM receiver, function of each block and wave/forms at input and output at different blocks.

11. ANTENNA AND PROPAGATION

11.1 Physical concept of radiation of electromagnetic energy from an antenna, relationship between the direction of electric and magnetic fields with direction of propagation; concept of polarisation of EM waves.

11.2 Electromagnetic spectrum and its various range VLF, LF, HF, VHF, UHF, Micro wave, Optical waves etc.

11.3 Definition and physical concepts of the terms used with antennas like point source, gain, power gain, directivity aperture, effective area, radiation pattern, (field strength, power and phase) beam angle, beam width and radiation resistance.

11.4 Types of antennas-Brief description, characteristics and typical applications of medium wave antenna, shortwave antenna, HF antenna, VHF, UHF and Microwave antenna e.g., half wave dipole, ground plane, yagi and ferrit rod antenna in transistor receiver. Brief idea about Rhombic antenna, dish antenna, Horn, Parabolic reflector and Lens antenna.

11.5 Antenna arrays-Brief description of broad side and end fire arrays, their radiation pattern and application (without analysis);

11.6 Basic idea about different modes of radio wave propagation-ground wave propagation, space wave propagation and sky wave propagation, their characteristics and typical areas of application. (e.g. medium wave, short wave, TV communication.)

11.7 Explanation of the terms-critical frequency, maximum usable frequency (MUF) and skip distance.

List of Books

1. Simon Haykin-Communication System- John Wiley & Sons.
2. Kennedy & Davis- Electronic Communication System - Tata Mcgraw Hill.
3. Sombir Singh - Principle of Communication Engineering - Jai Prakesh Publication, Meerut

COMMUNICATION ENGINEERING LAB

List Of Experiments

1. To observe an AM wave on CRO and calculate the modulation index.
2. To observe the output of reactance tube modulator.
3. To observe the output of balanced modulator.
4. Identification of different block and tracing of wave shapes at different block of a superhetrodyne radio receiver.
5. Tracing of circuit and fault finding in different stages of AM radio receiver.
6. Tracing of circuit and output of a AM detector circuit.
7. To plot the selectivity characteristics of a radio receiver.
8. To plot the sensitivity characteristics of a radio receiver
9. Tuning and alignment of radio receiver.
10. To study the different types of antennas.

4.5 POWER ELECTRONICS

(Common With Diploma In Electrical Engineering Spl. With Industrial Control)

L T P
4 1 3

Rationale :

Power electronics deals with high power solid state switching devices. It combines power, electronics and control. It is the application of the solid state electronics for the control and conversion of electric power. Power electronics has already found an important place in industries and are now used in a great variety of higher power applications including heating and welding controls, illumination controls, electric drive controls, power supplies, vehicle propulsion system, higher voltage direct current transmission and many other areas. An electrical engineering diploma holder has to deal with various power electronics equipment and controllers in the industry. Therefore, he should have adequate knowledge of operation and applications of high power switching devices as well as of power electronics and equipment.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Introduction	6	2	-
2.	Power Semiconductor Diodes	6	2	-
3.	Thyristors	3	1	-
4.	Power Transistors	8	2	-
5.	Controlled Rectifiers	8	2	-
6.	A. C. Voltage Controllers	8	2	-
7.	Choppers	6	2	-
8.	Inverter	6	1	-
9.	Power Supplies	5	1	-
Total		56	14	42

DETAILED CONTENTS

1. INTRODUCTION :
 - (I) Role of power electronics in the field of electric power control.
 - (II) Salient features of power semiconductor devices and relative comparison from application point of view.
 - (III) Characteristics and symbols of power semiconductor devices.
 - (IV) Types of power electronic circuits.
2. POWER SEMI CONDUCTOR DIODES :

- (I) Characteristics and applications of general purpose diode, fast recovery diode and schottky diode.
- (II) Series and Parallel operation of power diodes.
- (III) Performance parameters.

3. THYRISTORS :

- (I) Construction, characteristics and application of SCR, Gate, Turn off thyristor (GTO thyristor), Light activated SCR and reverse conducting SCR, Performance parameters.
- (II) Methods of triggering a SCR, Gate characteristics. General layout of gate triggering circuits, R-C firing circuit, characteristics of UJT and its application in the triggering of SCR, Triggering of GTO thyristor.
- (III) Commutation of SCR, methods of commutating a SCR, converter grade and Inverter grade SCRs.
- (IV) Series and Parallel operation of SCR.
- (V) Protection of SCR and GTO thyristor.
- (VI) Construction, Characteristics and applications of Diac and Triac.

4. POWER TRANSISTORS :

- (I) Characteristics and application of Bipolar Junction, Transistor, Power MOSFET, Performance Parameter.
- (II) Base drive requirements, Typical base drive circuits.
- (III) Series and parallel operation of power transistor.
- (IV) Protection of power transistor.

5. CONTROLLED RECTIFIERS :

- (I) Phase controlled rectifier operation on resistive and resistive inductive loads. Use of free wheeling diode.
- (II) Single phase and Three phase controlled and fully controlled bridge rectifiers, Dual converters, Effect of load and source inductance. Performance comparison. Capacitor aided commutation.
- (III) Single phase and Three phase line commutated bridge invertors.
- (IV) Simple numerical problems on controlled rectifiers.

6. A. C. VOLTAGE CONTROLLERS :

- (I) Principle of integral cycle control and phase control.
- (II) Single phase and Three phase A. C. voltage controllers. Various configurations.
- (III) Single Phase transformer Tap Changer.

(IV) Single phase and Three phase Cyclo-Converter.

7. CHOPPERS :

(I) Principle of operation and control techniques of chopper, current and voltage waveforms for resistive inductive static and motor loads, effects of chopper frequency and load inductance.

(II) Voltage commutated and current commutated thyristor chopper circuits. Power transistor chopper circuits, Use of input and output D. C. filters.

(III) Step up chopper and its applications.

8. INVERTERS :

(I) Single phase series and parallel inverters. Output voltage and current waveforms.

(II) Principle of operation of bridge inverter concept of voltage source. Current source and Pulse width modulated bridge inverter. Performance parameters.

(III) Single phase and Three phase voltage source (auxiliary and complementary commutated only) and current source bridge inverters, methods of voltage control, various techniques of pulse width modulation, comparison of voltage source and current source inverters application.

(IV) High frequency inverters and their application.

9. POWER SUPPLIES :

(I) D. C. and A. C. power supplies, Switched mode power supplies, Resonant power supply and Bi-directional power supply.

(II) Switching mode regulators, Principle of switching mode regulator; Bulk, Boost, Bulk-Boost regulators.

LIST OF PRACTICALS

1. V-I characteristics of SCR.
2. Study of R-C firing circuit of SCR.
3. Study of UJT firing circuit of SCR.
4. Study of Power Transistor as a switch.
5. Study of SCR as a switch.
6. Power control using Diac and Triac.
7. Fabrication and testing of Half Controlled Bridge Rectifier circuit.
8. Fabrication and testing of SCR Chopper Circuit.
9. Fabrication and Testing of Single Phase Series inverter circuit.

4.5 ELECTRICAL AND ELECTRONICS MINOR PROJECT

L T P
- - 6

GENERAL OBJECTIVES

After the completion this course the learner will be able to

1. Become familiar with identification and testing of common tools and components used in electrical and electronics.
2. Become familiar with domestic and semi-domestic practical models.
3. Become familiar with preparation of project report consisting of 4 to 5 pages.

Fabrication and testing of of the following mini projects -

1. Single Stage Amplifier
2. Full wave rectifier using Pi Filter
3. Two Stage R-C coupled Amplifier
4. Clipping and clamper circuit.
5. Porch light using LER & SCR.
6. Clap Switch
7. Water Level Indicator.
8. Temperature indicator.
9. Lamp Dimmer.
10. Seven segment display
11. Fabricate distribution board consisting of 2 or 3 electrical points.
12. Stair case wiring
13. 20/40 watt tube light connection diagram.

Note :

Student should fabricate and test at least 4 projects and to prepare a small project report for every project consisting of circuit diagram, brief detail of used component and total cost of the project (The report should not exceed from 4 to 5 pages).

Some other mini project can be prepared with the consultation of faculty member according to the local needs/availabilities.

L	T	P
6	2	-

RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Principles of Management	8	-	-
2.	Human Resource Development	10	-	-
3.	Wages and Incentives	4	-	-
4.	Human and Industrial Relations	6	-	-
5.	Professional Ethics	2	-	-
6.	Sales and Marketing management	10	-	-
7.	Labour Legislation Act	10	-	-
8.	Material Management	8	-	-
9.	Financial Management	8	-	-
10.	Entrepreneurship Development	8	-	-
11.	Fundamental of Economics	5	-	-
12.	Accidents and Safety	5	-	-
		84	-	-

DETAILED CONTENTS

1. **Principles of Management**
 - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling.
 - 1.2 Organizational Structure, Types, Functions of different departments.
 - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
 - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.
2. **Human Resource Development**
 - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
 - 2.2 Recruitment, methods of selection, training strategies and career development.
 - 2.3 Responsibilities of human resource management - policies and functions, selection - Mode of selection - Procedure - training of workers, Job evaluation and Merit rating.
3. **Wages and Incentives**
 - 3.1 Definition and factors affecting wages, methods of wage payment.
 - 3.2 Wage incentive - type of incentive, difference in wage, incentive and bonus; incentives of supervisor.
 - 3.3 Job evaluation and merit rating.
4. **Human and Industrial Relations**
 - 4.1 Industrial relations and disputes.
 - 4.2 Relations with subordinates, peers and superiors.
 - 4.3 Characteristics of group behaviour and trade unionism.
 - 4.4 Mob psychology.
 - 4.5 Grievance, Handling of grievances.
 - 4.6 Agitations, strikes, Lockouts, Picketing and Gherao.

- 4.7 Labour welfare schemes.
- 4.8 Workers' participation in management.
- 5. **Professional Ethics**
 - 5.1 Concept of professional ethics.
 - 5.2 Need for code of professional ethics.
 - 5.3 Professional bodies and their role.
- 6. **Sales and Marketing management**
 - 6.1 Functions and duties of sales department.
 - 6.2 Sales forecasting, sales promotion, advertisement and after sale services.
 - 6.3 Concept of marketing.
 - 6.4 Problems of marketing.
 - 6.5 Pricing policy, break even analysis.
 - 6.6 Distribution channels and methods of marketing.
- 7. **Labour Legislation Act (as amended on date)**
 - 7.1 Factory Act 1948.
 - 7.2 Workmen's Compensation Act 1923.
 - 7.3 Apprentices Act 1961.
 - 7.4 PF Act, ESI Act.
 - 7.5 Industrial Dispute Act 1947.
 - 7.6 Employers State Insurance Act 1948.
 - 7.7 Payment of Wages Act, 1936.
 - 7.8 Intellectual Property Rights Act
- 8. **Material Management**
 - 8.1 Inventory control models.
 - 8.2 ABC Analysis, Safety stock, Economic ordering quantity.
 - 8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
 - 8.4 Material handling techniques.
- 9. **Financial Management**
 - 9.1 Importance of ledger and cash book.
 - 9.2 Profit and loss Account, Balance sheet.
 - 9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.
- 10. **Entrepreneurship Development**
 - 10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
 - 10.2 Distinction between an entrepreneur and a manager.
 - 10.3 Project identification and selection.
 - 10.4 Project formulation.
 - 10.5 Project appraisal.
 - 10.6 Facilities and incentives to an entrepreneur.
- 11. **Fundamental of Economics**
 - 11.1 Micro economics.
 - 11.2 Macro economics.
- 12. **Accidents and Safety**
 - 12.1 Classification of accidents based on nature of injuries, event and place.
 - 12.2 Causes and effects of accidents.
 - 12.3 Accident-prone workers.
 - 12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
 - 12.5 Safety consciousness and publicity.
 - 12.6 Safety procedures.
 - 12.7 Safety measures - Do's and Don'ts and god housing keeping.

5.2 SWITCH GEAR AND PROTECTION:

L T P
4 1 -

Rationale

In view of the complexities associated with the modern interconnected power stations, the responsibilities and the job requirements of a diploma passout have become more complex than what they used to be earlier. He is required to work with modern electrical equipment and maintain reliability of supply.

The course is designed to develop the understanding of the principles and working of protective switchgear so that one can handle, install, maintain them and also take decisions at his level in different situations.

This subject teaching requires reinforcement from visits to substation, power stations and well designed laboratory experiences. A practical orientation to the teaching of this subject is suggested.

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Faults	12	3	-
2.	Switch gear	12	3	-
3.	Protective schemes	12	3	-
4.	Protection against over voltages	6	2	-
5.	Different types of substations	14	3	-
		56	14	-

DETAILED CONTENTS

1. Faults:

Types of faults, three phase symmetrical faults, effects of faults on system reliability and stability abnormalities, short circuits and their effects, representation of fault conditions through single line diagrams.
2. Switch Gear:
 - 2.1 Purpose of protective gear, characteristics of a protection system.
 - 2.2 Classification of fuses H.V. Fuses, application and working, grading and co-ordination L.V. fuses, selection of fuses, characteristics.
 - 2.3 Isolators and switches, out door isolators, functions, air break switches breaking capacity of switches.
 - 2.4 Circuit breakers :- requirements of circuit breakers definition of terms associated with circuit-breakers, reasons for arc formation, principles of arc extinction, types of circuit-breakers, comparison with oil circuit breaker classification, rating of circuit breakers, working of different types of

air and oil circuit breaker, specification of circuit breakers, maintenance schedule. SF-6 and Vacuum circuit breakers.

- 2.5 Relays : Requirement of relays, operation principles induction type over current, directional over current, differential, percentage differential relays working, applications and characteristics, basic principles of static relays. Introduction of distance relay.
3. Protective Schemes:
 - 3.1 Protection of alternators, stator faults, rotor faults, mechanical conditions, external faults their reasons, effect and protections used.
 - 3.2 Protection of power transformer : types of faults, its effects, types of protective schemes over current earth fault, differential protection, Buchholz devices, winding temp. protection.
 - 3.3 Motor protection: types of faults and protection in motors, thermal relays, protection of small motors, under voltage protection.
 - 3.4 Protection of feeders : radial, parallel and ring feeders protection, directional time and current graded schemes differential protection.
4. Protection Against Over Voltages:
 - 4.1 Causes of over voltages, travelling waves earth wire, protective zone, lightning arrestors, space-gap and electrolytic arrestors, surge absorber, location and rating of lightning arrestors. Thyrite lightning arrestor.
5. Different Type of Sub-Stations:-
 - 5.1 Layout, single line diagram busbar arrangement, equipments their functions, accessories, study of protective schemes, etc. batteries and their maintenance, operation of small sub-station.
 - 5.2 Reactors: types of reactors, busbar reactor, tuning reactor, arc-suppression reactor, connection of reactors in power stations. uses of reactors.
 - 5.3 Neutral grounding :- types of grounding solid grounding, reactance grounding, arc suppression coil grounding, choice of method of neutral earthing. grounding of sub-station, grounding of line structure and sub station equipment.
 - 5.4 Concept of G.I.S. (Gas Insulated Substation).

5.3 MICROPROCESSORS AND APPLICATIONS

(Common with Instrumentation & Control Engineering and Computer Engineering)

L T P
6 2 8

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Over View of Microcomputer System	7	2	-
2.	Introduction To 8085 Microprocessor	18	6	-
3.	Architecture of 8086 Microprocessor	18	6	-
4.	Assembly Language Programming	18	6	-
5.	Basic I/O Interfacing	18	6	-
6.	Memory Interfacing	18	6	-
7.	Advance Microprocessor & Micro Controllers	18	5	-
		84	28	112

DETAILED CONTENTS

1. OVERVIEW OF MICROCOMPUTERS SYSTEM:
 - 1.1 Functional block.
 - (a) CPU.
 - (b) Memory.
 - (c) Input/Out devices (Key board, Floppy drive, Harddisk drive, Tape drive, VDU, Printer, Plotter).
 - 1.2 Concept of programme and data memory.
 - (a) Registers (general purpose).
 - (b) external memory for storing data and results.
 - 1.3 Data transfer between registers.
 - 1.4 Concept of tristate bus.
 - 1.5 Control on registers.
2. INTRODUCTION OF 8085 MICROPROCESSOR:

Evolution of Microprocessor, Register Structure, ALU, BUS Organization, Timing and Control. Internal Architecture of 8085 microprocessor, Pin diagram and input output (in detail)
3. INTRODUCTION OF 8086 MICROPROCESSOR:

Internal organization of 8086, Bus Interface Unit, Execution Unit, Unit, register, Organization, Sequential

Memory Organization, Bus Cycle.

4. ASSEMBLY LANGUAGE PROGRAMMING :

Addressing Modes, Data Transfer, Instructions, Arithmetic and Logic Instruction, Program Control Instructions (Jumps, Conditional Jumps, Subroutine Call) Loop and String Instructions, Assembler Directives.

5. BASIC I/O INTERFACING :

Programmed I/O, Interrupt Driven I/O, DMA, Parallel I/O (8255-PPI, Centronics Parallel Port), Serial I/O (8251/8250, RS-232 Standard), 8259-Programmable Interrupt Controller, 8237-DMA Controller, 8253/8254-Programmable Timer/Counter, A/D and D/A conversion.

6. MEMORY INTERFACING :

Types of Memory, RAM and ROM Interfacing with Timing Considerations, DRAM Interfacing. Memory organization, Extension of memory in word length and depth, Memory mapping, Bus contention and How to avoid it.

7. ADVANCE MICROPROCESSOR AND MICRO CONTROLLERS :

Brief idea of Microcontroller 8051, Pentium and Power PC

NOTE :

Study of Popular ICs Read/Write Chips-8155/8156, 2114,2148,2164. ROM Chips- 8355,2716,2732,8755. Other support chips - 8279,8257,8275,8205.

LIST OF BOOKS

1. Singh, B. P. - Advanced Microprocessor and Microcontrollers- New Age International.
2. Singh, B. P. - Microprocessor Interfacing and Application - New Age International.
3. Brey, Barry B. - INTEL Microprocessor - Prentice Hall (India)-4th Edition.
4. Liu and Gibson G.A. - Microcomputer System - The 8086/8088 Family-Prentice Hall (India) 2nd Edition.
5. Sombir Singh - Microprocessor and Its Application - Jai Prakesh Publication, Meerut

MICROPROCESSORS AND APPLICATIONS LAB

List Of Practicals

1. Assembly language programming :- Programming of simple problems. Assembly Language Programming using addition, subtraction, multiplication, division, larger, largest, smaller, smallest, positive and negative, etc. 8 bit and 16 bit based programming

2. Simple programming problems using 8085 and 8086 microprocessor. Trainer kit to gain competence in the use of
 - (a) 8085 and 8086 Instruction set.
 - (b) Support chips of 8085 and 8086.

5.4 CONTROL SYSTEM

L T P
5 1 -

Rationale:

Control system has pronounced impact on the industrial processes almost all sophisticated automatic controls. A diploma holder with specialization in "Industrial Electronics and Control" has to bear the responsibilities of operation and maintenance of these plants and equipments in industry. Therefore the contents of this course have been selected on the basis of demand of modern industries. This subject deals with various control system devices and components, performance of control systems and various controllers used for improving the performance.

Sl. No.	Units	Coverage Time		
		L	T	P
1.	Introduction	6	1	-
2.	Components and Devices Used In Control System.	8	2	-
3.	Input Output Relationship of Simple Control System Components	8	2	-
4.	Performance of Control System	12	2	-
5.	Automatic Control Actions	8	2	-
6.	Controllers In Process Control	10	2	-
7.	PLC	8	2	-
8.	Overview of Process Controller	8	1	-
		50	14	-

Detailed Contents

1. Introduction:

Need of automatic control, Concept of open loop and closed loop control, Block diagram of feedback control system and its basic elements, definition and explanation of following control system.

- (i) Linear and Non-Linear Systems.
- (ii) Continuous and discrete Systems.
- (iii) Static and Dynamic Systems.
- (iv) Single Input Single Output (SISO) System and Multiinput Multioutput (MIMO) System.

Process and Process characteristics, Analogy with electrical system, Concept of process time delay.

2. Components & Devices Used In Control System:

Brief description and working of potentiometer, self balancing potentiometer, differential transformer, synchros, servomotors, tacho generators, DC Servo motors and DC Techo Generator, Eddy current clutch.

3. Input Output Relationship of System & Control system Components:
 - (i) Concept of transfer function and its use in control system.
 - (ii) Derivation of transfer function of following systems and components.
 - (a) Simple RC low pass network.
 - (b) First order thermal system and fluid level system.
 - (c) General Feedback Control System.
4. Performance of Control System:
 - (i) Step, Ramp, Pulse and sinusoidal type of inputs and their Laplace Transforms.
 - (ii) Time domain response of First order and Second order system with step input.
 - (iii) Definitions of Rise time, Peak overshoot, Settling time, Natural frequency and Damping Ratio pertaining to second order system.
 - (iv) Initial value and final value theorems and their use in control systems.
 - (v) Types of feedback systems and error constants.
5. Automatic Control Actions:

Control actions, Types of control actions, Two position control (On/Off action), Proportional, Proportional plus integral, Proportional plus derivative, Proportional plus integral plus derivative action.
6. Controllers In Process Control:
 - i. Electronic Controller:

On-OFF controller, Proportional, Proportional plus integral, Proportional plus integral plus derivative.
 - ii. Hydraulic & Pneumatic Controllers:

Principle and working of hydraulic controllers (Proportional and Proportional integral), Pneumatic P-I-D controller comparison of electronic, Hydraulic and Pneumatic controllers.
7. PROGRAMMABLE LOGIC CONTROLLER (PLC) :

Introduction, Principle of operation, Architecture of programmable logic controller, Programming unit (the programmable logic controller), Application of programmable logic controller.
8. OVERVIEW OF PROCESS CONTROLLER :

Process control, Data acquisition system, Data loggers, Supervisory control, Direct digital control, SCADA, Distributed control system.

5.5 ELECTRICAL DRAFTING IN AUTOCAD

L T P
- - 6

Rationale

AutoCAD Electrical features automate common design tasks and facilitate drafting productivity. AutoCad Electrical includes all the functionality of AutoCad software, plus electrical engineering features such as symbol libraries, bill of materials (BOM) reporting and PLC I/O design that make controls design faster and more efficient.

Sl. No.	Units	Coverage Time		
		L	T	P
1.	Introduction of AutoCad Electrical	-	-	-
2.	Project Files	-	-	-
3.	Schematics-I	-	-	-
4.	Schematics-II	-	-	-
5.	Editing Command	-	-	-
6.	Panel Drawing	-	-	-
7.	Terminals	-	-	-
8.	PLC Symbols	-	-	-
9.	Point To Point Wiring Drawings	-	-	-
10.	Symbol Creation	-	-	-
11.	Title Block	-	-	-
12.	Reporting Tools	-	-	-
13.	Setting & Templates	-	-	-
14.	Drawing Update Tools	-	-	-
		-	-	100

DETAILED CONTENTS

1. INTRODUCTION TO AUTOCAD ELECTRICAL:

What is AutoCad electrical, drawing files, electrical files, electrical components and wires, design methodologies.
2. PROJECT FILES :

Project files, Project manager interface, Accessing project files, Opening a drawing, Create a drawing to a project file, Managing drawings in projects, Project manager drawing list.
3. SCHEMATICS - I SINGLE WIRES/COMPONENTS :

Referemcomg, Ladders, Insert wores, Edit wires, Add rungs wire setup, Wire numbers, Source and destination singal arrows, Insert component, Parret/Child component.
4. SCHEMATICS - II MULTIWIRE AND CIRCUITS :

Dashed link lines, 3 phase laddres, Multiple wire bus, 3 Phase wire numbering, cable markers, fan in.out, insert saved circuits, save circuits to icon menu, wblock circuits, move circuit, copy circuit, circuit builder.

5. EDITING COMMANDS :

Edit component, Project Task list, Move components, Copy components, Align, Delete component, Surfer command, Copy catalog assignment, Copy installation/location code values, Attribute editing commands.

6. PANEL DRAWINGS :

Insert Foot Print (Icon Menu), Insert Foot Print (Schematic List), Insert Component (Panel List), Edit Foot Print, Assign Item Numbers, Add Balloons.

7. TERMINALS :

Insert terminal symbols, Multiple level terminals, Multiple insert component command, Insert jumpers, Terminal strip editor, Din rail command.

8. PLC SYMBOLS:

Insert PLC (Parametric), Insert PLC (Full Units), Insert individual PLC I/o points, PLC based taffing, Spreadsheet to PLC I/o Utility.

9. POINT TO POINT WIRING DRAWINGS :

Insert connectors, Editing connectors, Insert spliess, Insert multiple wires, Bend wires.

10. SYMBOL CREATIONS :

Schematic symbol, Naming convention, Icon menu wizard, AutoCad electrical databases, Projects database, Catalogue Database, Foot Print Lookup Database, PLC data base, Pin list data ase, Terminal properties database.

11. TITLE BLOCKS :

Update Title Blocks, Title Block Setup.

12. REPORTING TOOLS :

Create Reports, Save to External Files, Put on Drawing, Configure Reoprts Templates, running Automatic Reports, Electrical Audit.

13. SETTING AND TEMPLATES :

Project Properties, Drawing properties, Pannel Drawing configuration, Templates Files, Sharing Symbol Libraries and Database

14. DRAWING UPDATE TOOLS :

Project-wide update/Retag, Project-wide utilities, Plot project, Export to spreadsheet, Copy project, Swap/Update block, Mark drawing, Verify drawing.

VI SEMESTER

6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

L T P
4 - -

RATIONALE:

A diploma student must have the knowledge of different types of pollution caused due to industrialisation and construction activities, so as he may help in balancing of eco-system and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.

TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Introduction	6		
2.	Pollution	4		
2.1	Water Pollution	8		
2.2	Air Pollution	8		
2.3	Noise Pollution	4		
2.4	Radio Active Pollution	6		
2.5	Solid Waste Management	6		
3.	Legislations	4		
4.	Environmental Impact Assessment	4		
5.	Disaster Management	6		
TOTAL		56	-	-

DETAILED CONTENTS

1. INTRODUCTION :

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.
- Lowering of water level , Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes .Use of biopesticides and biofungicides.
- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain,etc.

2. POLLUTION :

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION :

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, CO, CO₂, NH₃, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.
 - A. Settling chambers
 - B. Cyclones
 - C. Scrubbers (Dry and Wet)
 - D. Multi Clones
 - E. Electro Static Precipitations
 - F. Bog Fillers.
- Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

2.4 RADISACTIVE POLLUTION :

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made thereunder-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.

- The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.
 - # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
 - # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003.
 - # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
 - # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
 - # Municipal Solid Wastes (Management and Handling) Rules, 2000.
 - # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT :

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

6.2 INDUSTRIAL DRIVES AND CONTROL

L T P
6 2 8

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Electrical Drives	6	1	-
2.	Dynamics of Control of Electrical Drives	15	3	-
3.	Selection of Motor Power Rating	15	3	-
4.	DC Drives	15	3	-
5.	AC Drives	12	2	-
6.	Traction Drives	12	2	-
		84	14	84

DETAILED CONTENTS

1. ELECTRICAL DRIVES :
 - 1.1 An introduction to Electrical Drives
 - 1.2 Advantages of Electrical Drives.
 - 1.3 Parts of electrical drives- Electrical Motors, Power modulators, Sources, Control Unit.
 - 1.4 Choice of Electrical Drives.
 - 1.5 Status of DC and AC Drives.
2. DYNAMICS AND CONTROL OF ELECTRICAL DRIVES :
 - 2.1 Fundamental Torque Equations.
 - 2.2 Speed Torque conventions and multiquadrant operation.
 - 2.3 Equivalent values of drive parameters.
 - 2.3.1 Load with rotational motion.
 - 2.3.2 Load with translation motion.
 - 2.3.3 Measurement of moment of inertia.
 - 2.4 Components of load torques.
 - 2.5 Nature and classification of load torques.
 - 2.6 Calculation of time and energy loss in transient operation.
 - 2.7 Steady state stability.
 - 2.8 Load Equalisation.
 - 2.9 Speed control and drive classifications.
 - 2.10 Closed-Loop Control of Drives.
 - 2.10.1 Current limit control
 - 2.10.2 Closed-loop torque control

- 2.10.3 Speed sensing
- 2.10.4 Phase locked loop (PLL) Control
- 2.10.5 Closed loop position control.

3. SELECTION OF MOTOR POWER RATING :

- 3.1 Continuous Duty.
- 3.2 Equivalent current, torque and power methods for fluctuating and intermittent loads.
- 3.3 Shot time duty.
- 3.4 Frequency of operation of motors. Subjected to intermittent load.

4. DC DRIVES :

- 4.1 Introduction
- 4.2 Basic Characteristics of DC Motors
- 4.3 Operating Modes.
- 4.4 Single phase drives.

- 4.4.1 Single Phase halfwave converter Drives
- 4.4.2 Single Phase Semi converter Drives
- 4.4.3 Single Phase Full converter Drives
- 4.4.4 Single Phase Dual converter Drives

4.5 Three Phase drives -

- 4.5.1 Three Phase Half Wave Converter Drives
- 4.5.2 Three Phase Semi Converter Drives
- 4.5.3 Three Phase Full Converter Drives
- 4.5.4 Three Phase Dual Converter Drives

4.6 DC-DC Converter Drives -

- 4.6.1 Principle of Regenerative Break Control
- 4.6.2 Principle of Rheostatic Break Control
- 4.6.3 Principle of combined Regenerative & Rheostatic Break Control
- 4.6.4 Two & Four Quadrant DC-DC Converter Drives

4.7 Closed Loop Control of DC Drives -

- 4.7.1 Phase Locked Loop Control
- 4.7.2 Open Loop and Closed Loop Transfer Function.

5. AC DRIVES :

- 5.1 Introduction
- 5.2 Performance Characteristics
- 5.3 Rotor Voltage Control
- 5.4 Frequency Control
- 5.5 Voltage and Frequency Control
- 5.6 Current Control
- 5.7 Voltage, Current and Frequency Control
- 5.8 Closed Loop Control of Induction Motors.
- 5.9 Synchronous Motor Drives

- 5.9.1 Cylindrical Rotor Motor
- 5.9.2 Salient Pole Motor
- 5.9.3 Reluctance Motor
- 5.9.4 Permanent Magnet Motors.
- 5.9.5 Switched Reluctance Motors.

- 6. TRACTION DRIVES :
- 6.1 Electric Traction services.
- 6.2 Nature of Traction Load
- 6.3 Braking
- 6.4 Important Features of Traction Drives.
- 6.5 Traction Motor -
 - 6.5.1 Motor Employed in Traction
 - 6.5.2 Traction Motor Control
- 6.6 Traction Drives -
 - 6.6.1 A D.C. Traction drives employing resistance control.
 - 6.6.2 25 KV, 50 Hz, A.C. traction using on load transformers tap changer.

INDUSTRIAL DRIVES AND CONTROL LAB

1. Fabrication and testing of electronic fan speed regulator.
2. Study of serving motor and synchros.
3. To study speed control of separately excited DC motor by varying armature voltage using single phase fully controlled bridge converter.
4. To study speed control of separately excited DC motor by varying armature voltage using single phase half controlled bridge converter.
5. To study speed control of separately excited DC motor using single dual converter.
6. To study speed control of separately excited DC motor using MOSFET/IGBT chopper.
7. To study speed control of single phase induction motor using single phase AC voltage controller.
8. To study speed control of Three Phase induction motor using Three Phase AC Voltage controller.
9. Thristered speed control of 3 Phase induction motor.
10. To study speed control of Three Phase Slip Ring Induction Motor using Static Rotor Resistance Control using Rectifier and Chopper.

6.3 TROUBLE SHOOTING AND SERVICING

L T P
- - 6

GENERAL OBJECTIVES

After the completion this course the learner will be able to

1. Become familiar with identification and testing of common tools and components used in electrical and electronics.
2. Become familiar with fault finding/servicing of common domestic equipments.
3. Become familiar with procedure adopted for the trouble shooting/servicing such as symptoms analysis, circuit tracing, major measurement and signal injection and tracing etc. consisting of 4 to 5 pages.

Students have to perform at least 10 types of trouble shooting/ serviceing. Some of them are given -

1. Trouble shooting and servicing of common lab equipment such as multimeter, power supply, energy meter, CRO etc.
2. Trouble shooting and servicing of the following
 - Room Heater
 - Fans
 - Tube Light
 - Stabilizers
 - Invertor
 - House Wiring
 - Radio Receiver
 - Refrigerator
 - Single/Three Phase Wiring
 - DVD Player
 - Electric Press
 - DC Motors/Induction Motors (3 Phase and 1 Phase)
 - Single Phase and Three Phase Transformer

other home/industrial applainace can also be included with consultation of the faculty member.

In each exercise the curcuit diagram, operating voltages at major point and the component replaced must be shown very clearly.

6.4 ELECTIVES
6.4 (A) ENERGY MANAGEMENT

(Common With Diploma In Electrical Engineering)

L T P
5 1 -

Rationale:

One of the reasons for India not been able to catch up with the desired extent of modernization of industrial processes in light of challenges posed by multinationals is the non-availability of required energy supply. The solution primarily lies in tapping all possible energy generation sources but efficient use of available energy is also important. Energy management focuses on these aspects and the course will develop a awareness amongst the diploma engineers and will enable them to practice of the energy management techniques in whatever field they are engaged in.

S.N.	Units	Coverage Time		
		L	T	P
1.	Energy Management	15	3	-
2.	energy Conservation	15	3	-
3.	Energy Efficient Devices	20	4	-
4.	Energy Audit	15	3	-
5.	Environmental Impact Assessment	5	1	-
		70	14	-

DETAILED CONTENTS:

1. ENERGY MANAGEMENT :
 1. Overview of energy management, need for energy conversation (Started with oil crisis). Environmental Aspects, Alternative sources of energy.
 2. Need for Energy conservation with brief description of oil and coal crisis.
 3. Environmental aspects.
 4. Alternate sources of energy.
 5. energy efficiency-its significance.
2. ENERGY CONSERVATION :
 1. Energy conservation in Domestic Sector - Lighting, Home appliances.
 2. Energy conservation In industrial Sector - Motors, Industrial lighting, Distribution system, Pumps, Fans, Blowers, etc.
 3. Energy conservation in Agriculture sector, Tubewell pumps, Diesel generating sets, Standby energy sources.
 4. Macro level approach for energy conservation at design stage.
3. ENERGY EFFICIENT DEVICES :

1. Need for energy efficient devices.
2. Initial cost versus life cycle cost analysis on life cycle basis.
3. Energy efficient motors as compared to standard motors.
4. BIS specification for energy efficient motors, Salient design features.
5. Efficiency as a function of load, safety margins.
6. Energy efficient lighting system different sources, lumens/watt, LEDs, role of voltage on efficiency.
7. Distribution system- Optimum cable, amorphous core transformer, role of power factor, use of compensating capacitor-manual and automatic, location of capacitors.

4. ENERGY AUDIT :

1. Energy Audit Methodology
2. Efficiency of energy conversion processes, monitoring system.
3. Specific energy consumption- Three pronged approach, Five tuning, Technical up.
4. Gradation, Avoidable losses.
5. Case studies of energy audit of distribution system, AC motors, Industries.
6. Organisation of energy audit activities.

5. ENVIRONMENTAL IMPACT ASSESSMENT :

1. Need for Environmental Impact Assessment.
2. Standard format for assessment and its completion.
3. Evaluation of the assessment.

LIST OF BOOKS

1. Manual on energy efficiency at design stage-CII Energy Management Cell.
2. Manual on energy efficiency in pumping system-CII Energy Management Cell.
3. Manual on variable speed drives for energy efficiency -CII Energy Management Cell.
4. Energy conservation case studies in Ceramic industry, Sugar industry, Fertilizer industry, Cement industry-CII Energy Management Cell, etc.

6.4 (B) MODERN COMMUNICATION SYSTEMS

(Common with Diploma In Electronics Engineering)

L T P
5 1 -

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction To communication System	3	-	-
2.	Telegraphy & Telephony	6	-	-
3.	Digital Switching Systems	16	-	-
4.	Optical Communication	18	-	-
5.	Digital Communication	18	-	-
6.	Setellite Communication	15	-	-
7.	Mobile Communication	15	-	-
8.	Data Communication	21	-	-
		112	-	84

DETAILED CONTENTS

1. INTRODUCTION TO COMMUNICATION SYSTEM :
 - Basic idea of telegraphy, telephonic, digital, microwave, fibre optics, sttellite, mobile and data communication.
2. TELEGRAPHY AND TELEPHONY:
 - A. Facsimile transmission- Elementary idea of Fax machine and its operation, Transmission and Receiving process
 - B. Telephone component- Construction and working of transmitter and receiver components, parts, curcuit and working of subscriber's push button telephone sets.
 - C. Brief idea of Automatic Exchanges
 - D. Brief Idea of Electronic Exchanges and PCO.
3. DIGITAL SWITCHING SYSTEM :
 - Salient feature, architecture and services of C-DOT 128, C-DOT 256, C-DOT 512, EWSD (Electronic Digital Switching Network, OCB-283.
4. OPTICAL COMMUNICATION:
 - 4.1 Introduction : Block diagram of optical fiber communication system, advantages of optical communication
 - 4.2 Optical Fibre : Structure of optical wave guide, light propagation in optical fiber, Ray and wave theory, Modes in optical fiber, Step and Graded index fibers.
 - 4.3 Transmission Characteristics of Optical Fibers : Signal degradation in optiecal fibers, Attenuation losses in optical fibers. Dispersion and pulse broadening in different types of fibers, Modal birefringence and polarisation maintaining fibers.

- 4.4 Principle laser action types of lasers, fabrication and characteristics of semiconductor lasers and L.E.D.'s
- 4.5 Requirements for Photo detectors, Types of photo detectors, Characteristics of photo detectors. Principle of APD and Pin diodes. Phot transistor and Photo Conductors.
- 4.6 Components of an optical fiber communication system, Digital and Analog Optical Communication System.
5. DIGITAL COMMUNICATION:
- 5.1 Elements of Digital Communication and information theory : Model of a digital communication system, Logarithmic measure of information. Source coding fixed in and variable length code words. Hartely-Shannon law for channel.
- 5.2 Sampling Theory and Pulse Modualtion : Sampling theorem, Signal reconstruction in time domain. Types of analog pulse modulation, Method of generation and detection of PWM, PNM and PPM.
- 5.3 Waveform Coding Technique : Quantization, Quantization noise, Encoding and Pulse code modulation, Differential pulse code modulation, Delta modulation, Comparison of PCM and DM.
- 5.4 Digital Multiplexing : Fundamentals of time division multiplwxing electronic commutator.
- 5.5 Digital Modulation Techniques : Types of digital modulation, Wave forms for amplitude, Frequency and phase shift keying, Method of generation and detection of coherent and non-coherent binary ASK,FSK & PSK, Differential phase shift, Quadrature modulation techniques. (QPSK and MSK) Probability of error and comparision of various digital modulation techniques.
- 5.6 Error Control Coading : Error free communication over a noisy channel, Hamming sphere, Hamming distance and Hamming bound, Relation between minimum distance and error detecting and correcting capability.
6. SATELLITE COMMUNICATION:
 - (i) Introduction, historical background and basic Concepts of satellite communication. Elements of satellite communication link.
 - (ii) Geostationary orbits, Orbit mechanisms and lauching of satelllte
 - (iii)Satellite space craft- Satellite sub system, Tracking and Command, Communication subsystem, Transponders, Space Craft antena
 - (iv) Satellite Channel and Link Design : Degin of down links and uplinks
 - (v) Earth stations technology : Earth Station Design, Earth Station Tracking, Low noise amplifiers.

(vi) Multiple access techniques :Frequency Division Multiple Access (FDMA), FDM/FM/FMFDMA, Time division, Multiple Access, Frame Structure and Synchronization, Code division, Multiple Access, random Access.

(vii) Introduction to DTH system

7. MOBILE COMMUNICATION :

Evaluation of mobile communication, A simplified reference model for mobile communications.

A brief introduction of frequency for radio transmission, signals, propagation, Multiplexing, Modulation, Spread spectrum, Cellular system.

Medium Access Control : Introduction To MAC, Advance Mobile Phone. Introduction to GSM(Global System For Mobile Communication), GPRS, GPS, Enable Positioning System.

System Architecture, Protocol Architecture, Physical Layer and MAC layer.

Mobile Networks

8. DATA COMMUNICATION :

1. Data Transmission Basics : Review of digital data analog modulation and digital formats. Data rates, Baud Rates, Channel capacity, Mediums for communication, Synchronous and asynchronous data communication.
2. ISO-OSI model and TCP/IP model of network, Protocols and services. Connection oriented and connectionless services, their interpretation at different layers. Quality of services, Design issue for different layers.
3. Data Links Layer Design Issues : Services provided to network layer froming: Necessity and techniques. Error control feature and review of techniques.
4. IEEE 802 standards for computer networks.
5. Brief idea of network layer, transport layer.
6. Internet and ISDN services.

LIST OF BOOKS

1. Roody, Dennis and Coolen, John- Electronic Communications- 4th Edition-PHI
2. Kennedy, George and Davis, Bernard- Electronic Communication System- 4th Edition-Tata Mcgraw Hill.
3. Haykin, Simon - Communication System - 4th Edition- John Wiley.
4. Tanenbaum, Andrew S. - Computer Network- 3rd Edition-PHI
5. For Digital Switching System- Learning Material compiled by I.R.D.T. is provided to all polytechnic.
6. J. Gowar - Optical Communication - PHI.
7. G. E. Keiser - Optical Fibre Communication - Mc Graw Hill

- Pub.
8. S. Haykin - Communication System - John Willy & Sons (IV Edn.)
 9. D. Roddy - Satellite Communication - PHI 1998
 10. D. C. Agarwal - Satellite Communication - Khanna Pub.
 11. J. Schiller - Mobile Communication - Pearson Education IInd Ed.
 12. Tanenbaum Andrew S. - Computer Networks - Prentice Hall (India) IIIrd Ed.

MODERN COMMUNICATION SYSTEMS

List Of Practicals

1. Study of FAX machines and its working.
2. To study the parts of telephone hand set :
 - (a) Frequency response of telephone receiver.
 - (b) To observe the wave form of impulses by dialling a number.
3. Visit and study of Digital Switching System.
4. Visit and study of Satellite transmission system.
5. Demonstration of sampling, FSK and PSK by simple experiment.
6. Demonstration of optical fibre communication through simple kits.
7. Study of working of mobile phones and its services.
8. Study and use of ISDN and Internet services.
9. Testing and fault finding of mobile phone and its service.
10. Visit and study of celluler base station.
11. Study of DTH system

NOTE: Report of every visit has to be submitted by each student along with the practical record to be examined by the examiner.

6.4 (C) ELECTRIC TRACTION
(Common with Diploma In Electrical Engineering)

L T P
5 1 -

Rationale

Now a days electrical energy finds major application in electric traction besides steam and deisel locomotives. Therefore a diploma holder is required to have elementary knowledge of electric drives used in traction accelerating and breaking arrangements at the control pannel.

Sl. No.	Units	Coverage Time		
		L	T	P
1.	Introduction	4	1	-
2.	Electric traction drives	8	1	-
3.	Power supply for traction	8	2	-
4.	Mechanics of traction	8	2	-
5.	Rectification equipment	6	1	-
6.	Overhead equipments	6	1	-
7.	Track circuit	10	2	-
8.	Supervisory remote control	10	2	-
9.	Rail and return path	10	2	-
		70	14	-

1. Introduction:

Electric traiction system and its advantages over other system, types of electric traction systems. Traction systems for India.
2. Electric traction drives:

Suitability of electric traction drives- D.C. series motor, A.C. series motor, 3 phase induction motor, characteristics of electric traction drives, special design requirements, methods of starting and speed control, different methods of braking, plugging, rheostatic, regenerative.
3. Power supply of electric traction:

Different systems of power supplies, their chronological evalution, power supply arrangement i.e. traction substation major equipement transformer, circuit breaker, interuptor, protection system, remote control system, design consideration.
4. Mechanics of traction

System of units, speed time curves, their construction, simplification and interpretation for main line, suburban routs, tractive effort, specific energy consumption and factors effecting it. Weight transfer due to torque coefficient of adhesion.
5. Rectification Equipment

Equipments required for rectification their brief

theory and working.

6. Over head Equipments

Design aspects of over head equipments catenary and its types, practical aspects of working, maintenance of over head equipments, current collection system, their requirements.

7. Track Circuits

D.C. and A.C. track circuits, signals for traffic control,

8. Supervisory Remote Control

System of remote control, its advantages, mimic diagram, remote control system and network remote control centre (R.C.C.)

9. Rail and Return Path

Earth return protection of under ground equipment, Negative booster, voltage distribution on rails.

6.5 PROJECT

L T P
- - 6

GENERAL OBJECTIVE:

Purpose of the project work is :

- (i) To develop abilities of diagnosing problems.
- (ii) To develop the abilities to :
 - (a) Make literature survey.
 - (b) Design/develop/frbricate/test simple circuits.
 - (c) Prepare documents for electronic work.
 - (d) Work as a team.

LIST OF PROJECTS (TO BE ASSESSED INTERNALLY):

The list of projects shown below is indicative of general nature and the complexity of work to be entrusted to students. (Teachers can modify this list to shut local needs and constraints keeping the level of complexity as suggested here).

1. To assemble and test a regulated power supply (15 V/ 1Amp).
2. To assemble and test a two stage R/c coupled amplifier and to calculate overall gain, loading effect and frequency response curve.
3. To assemble and test a inverter (500 W).
4. To assemble and test the speed control of motor.
5. To assemble and test a battery charger with necessary control.
6. To assemble and test an automatic street light controller.
7. To assemble and test an automatic door opener/closer of a college/factory.
8. To assemble and test an audio amplifier (50 W).
9. To assemble a AM/FM Radio receiver.

NOTE:-

1. Depending upon the complexity of the work, the teacher may assign any number of project work to a group. The group size will also be similarly decided by the teacher, normally between 2 to 4 students per group.
2. A project report (of about 100 typed computer pages) should submitted covering the following points.

3. Basic design procedure for the project circuit.
4. Full block diagram and/or circuits diagram showing the component values.
5. Component layout diagram, including component and copper side details of the PCB used.
6. List of components used showing types voltage/current ratings, tolerance values and other specifications.
7. Details of heatsink used IC and Transistor pin connections and types of packages.
8. Test and measurement procedure.
9. Discussion on the deviation of the results from the given specifications.
10. Estimating and costing with discussion about selection of components from cost point of view.

SPACE REQUIREMENT

[A] ADMINISTRATIVE BLOCK

Sl. No.	Details of Space	Floor Area Sq. metres
1.	Principal's Room	30
2.	Confidential Room	10
3.	Steno's Room	6
4.(a)	Office including Drawing Office	80
(b)	Record Room	20
5.	Staff Room	
	(a) Head 1	15
	(b) Lecturer 10 sq.m./ Lect. for 8 Lecturers	80
6.	Library and Reading room	150
7.	Store	100
8.	Students Common room	80
9.	Model Room	90

[B] Academic Block

Sl.No.	Detail of Space	@ Sq.m	Floor Area Sq.m.
1.	Class Room	60	120
2.	Drawing Hall	90	90
3.	Physics Lab		75
7.	Microprocessor & Microcontroller and Digital Electronics, Electronic Component & Devices Lab		120
8.	Trouble Shooting and Project Lab		120
10.	Electrical & Electronics Measurement1		75
11.	Electrical M/c & Industrial Drive, 1		120
	Basic Elect. Engg & Circuit Analysis		
12.	Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling)		60

[C] Work shop

I	Workshop Supdt. Room	12
II	Store	20
III	Shops	
(a)	Wood & Laminate Shop	50
(b)	Fitting Shop	50
(c)	Painting Shop	50
(d)	Sheet Metal ,Soldering & Brazing shop	50

[D] Student's Amenities

1.	Hostel	40	%	of Strength of Students
2.	Cycle Stand	50	%	of Strength of Students
3.	Canteen and Tuck shop	50		
4.	N.C.C. Room	70		
5.	Dispensary	40		
6.	Guest Room(Attached Bath)	45		
	including kitchen & store			

[E] STAFF RESIDENCES

1.	Principal	1	100	100
2.	Head of Department	1	100	100
3.	Lecturer	4	80	320
4.	Non teaching & Supporting staff	8	60	480
5.	Class IV	6	30	180

Priority to be given in following order

- (1)
 - a. Administrative Building
 - b. Labs
 - c. Workshop
 - d. Over head Tank
 - e. Boundary Wall
 - f. Principal Residence
 - g. Forth Class Quarters (2/3)

- (2)
 - a. Hostel
 - b. Students Amenities

- (3)
 - Residences of employee

LIST OF EQUIPMENTS

Only those of the equipments given below which are essentially required for the conduction of practicals mentioned in the curriculum are to be procured by the institutions.

"Machine/Equipments/Instruments of old BTE list which are not included below are to be retained in the Lab/Shop for Demonstration purpose but not to be demanded fresh for purchase."

NOTE : Equipment for different shop and lab of latest version should be purchased.

I. APPLIED PHYSICS LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Brass ball with hook dia 1.8 Cm to 2 Cm diameter	2	50	100
2.	Stop watch least count Least Count 0.1 Sec.(non-magnetic) 0.01 sec to 0.001 sec (Electronic Desirable)	4	750	3000
3.	Wall bracket with clamping arrangement 8" to 10" length	2	50	100
4.	Meter scale Least count 0.1cm, wooden 1meter	5	40	200
5.	Meter scale Least count 0.1cm, wooden 50 Cm	5	40	200
6.	Searl's conductivity apparatus with copper & steel rods 25 cm length 4 cm.diameter with all accessaries	2 set	1500	3000
7.	Constant Level Water Flow Container of one liter capacity vertical stand & rubber tubing	2	250	500
8.	Thermometer 0-110oC(Least count 0.1oC desirable)	4	100	400
9.	Potentiometer - 10 wires (1 meter length of each wire) with jockey, sunmoical top	4	750	3000
10.	Moving coil galvenometer 30-0-30 with moving mounting	5	300	1500
11.	Rheostat 50 ohm., 100 Ohm., 150 Ohm. 16 capacity		300	4800
12.	Lead Accumulator 2V, 6V (1 No. Each)	2	250	500
13.	Meterbridge 1 meter length, sunmica top copper strips fitted with scale	2	300	600
14.	Resistance Coil (Standard) 1 ohm. to 10 ohm.	10	50	500
15.	Moving coil ammeter 0-1 amp., 0-2 amp., 0-5 amp. with mounting	8	250	2000
16.	Moving coil voltmeter 0-1 V., 0-2V 0-5 V., 0-10 V. with mounting	8	250	2000
17.	Denial cell with complete accessories	2	250	500

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
18.	Leclanche Cell with complete accessories	2	250	500
19.	Standard Cadmium Cell with complete accessories	2	250	500
20.	Battery Charger with complete accessories	1set	1800	1800
21.	Battery Eliminator Multi range	2set	750	1500
22.	Multimeter(Digital)	1set	800	800
23.	Carey Foster Bridge (With all accessories)	2set	4500	9000
24.	Resistance Box (2 No. Each) 0-1 Ohm, 0-100 Ohm.	4	850	3400
25.	Fractional Resistance Box 0-1 Ohm.	2	1200	2400
26.	Post office box Key type	2	1200	2400
27.	Post office box Dial type	2	1200	2400
28.	Resistance Wire(100 Gm.) (Constanton/Maganin)	1 lacchi	100	100
29.	Connecting Wire Copper(1/2 Kg.) (Cotton Insulated)	1 lacchi	700	700
30.	Screw gauge L.c 1/100 mm	5set	150	750
31.	Vernier Callipers L.c. 1/10 mm	5set	100	500
32.	Appratus for determining character- stics of P-N junction diode complete with all accessories	2 set	1500	3000
33.	Resonance Column of steel One Meter length and 3-4 Cm diameter fitted with scale & water level arrangement	2	1600	3200
34.	App. for determining coefficient of friction on a horrizontal plane (Complete with all accessories)	2 set	700	1400
35.	Tuning Fork's Sets Set of different frequency (with rubber pad)	3set	350	1050
36.	Physical balance with weight box Complete with Fractional weight	2	800	1600
37.	Anemometer with counter cup type	1	1000	1000
38.	Spring Force Constant Apparatus with graduated mirror & pointer, weight set with hanger	2	1200	2400
39.	Viscosity Apparatus (Stock law) with steel balls and viscous liquid & timer	2set	1600	3200
40.	Thermometer of different range Mercury thermometer 0-50oC to 0-110oC	10set	100	1000
41.	Wall Thermometer Alcohol Filled 0-50oC	2set	20	40
42.	Sprit Level Technical Type	1set	60	60
43.	Drilling Machine Electric with different size bits	1set	800	800
44.	LPG Gas Burner with Cylinder	1set	800	800
45.	Tool Kit with different tools Complete	1set	800	800
46.	Lab stools	30		

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
47.	Lab tables	8		
48.	Plug Keys One Way	5	50	250
49.	Plug Keys Two Way	5	100	500
50	Helical Springs - Soft, 10 cm each	6	100	600

INTRODUCTION TO COMPUTER (Common to all Trades)

COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST (in Rs.)
1.	Core-2 Quad Processor, 4GB RAM 1 GB SATA HDD, 19" TFT Monitor/ Server of Latest Specification OS-Windows 2007/2008/Latest Version	02 Server	1,20,000=00
2.	General Desktop Computer-Intel i5 60 node or Higher(with latest Specification Pre loaded latest Anti Virus with Life time Subscription, Licence Media and Manual with UPS 660 VA with latest window OS Including licence OR Computer of latest Specification With latest window os including licence		36,00,000=00
3.	Software :((Latest Version)		
	i. MS OFFICE 2010/Latest Version		LS LS
	ii. COMPILER 'C', C++, JAVA-7		LS LS
4.	Hardware		4,50,000.00 LS
	i. Switch-32 Port		02
	ii. Router		02
	iii. Hub		04(8 Port)
	iv. Ext. Modem		02
	v. Wireless N/W Adaptor		02
	vi. Series Access Point		02
	vii.LAN Cable Meter		05
	viii. LAN Cable Analyzer		05
	ix. Crimping Tool		15
	and all other accessories related to Networking		
5.	Scanner- Flat Bed A4/Auto Lighter (Bit depth 48)		02 20,000
6.	132 Column 600 CPS or faster 9 Pin dot matrix printer with 500 million character head life		02 50,000
7.	Laser Jet-A4 All In one 20 page per min (2 Each)		04 50,000
8.	Desk Jet-A4 Photo Smart (2 Each)		04 40,000
9.	5 KVA on line UPS with minimum 30 minute battery backup along with sealed maintenance free batteries. Provision for connecting external batteries with network connectivity.(For 2 Labs)		04 8,00000

10.	Split Air Conditioner 1.5 tones capacity with ISI mark along with electronic voltage stabilizer with over voltage and time delay circuit	08	35,0000
11.	Room preparation and furniture	LS	
12.	19" rack, 24-port switch. connector RJ-45 Cat-6 cabling for network	LS	10,0000
13.	2 KVA Inverter Cum UPS	02	6,0000
14.	Fire Extinguisher (2 Kg.)	04	15000
15.	Fire Extinguisher (5 Kg.)	04	25000
16.	Vacuum Cleaner	02	25000
17.	LCD Projector 3000 Lumen with all Accessories	02	350000
18.	Pen Drive 16 GB	10	10000
19.	DVD Writer External	02	10000
20.	HDD External 500 GB	02	15000
21.	PAD (Latest Configuration)	02	15000
22.	Broadband For Internet(Speed Min. 8mbps)	04	LS
23.	USB Modem	02	8000
24.	Generator 15 KVA Water Coolant	01	450000

ELEMENTARY WORKSHOP PRACTICE

(A) Fitting Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Work Benches with Vices (4 vices on a bench)	30	150000
2.	Marking Tables with Scribers (40cm x 60cm)	12	60000
3.	Surface plates (450cm x 60cm:CIII)	10	30000
4.	Bench Grinder	2	20000
5.	Bench Drilling Machines (12 mm capacity with tapping attachment)	4	50000
6.	Power Hacksaw	2	40000
7.	Tool Kits, Chisels, Hammers, Files, Hacksaw etc.	70 Sets	40000
8.	Taps, Dies & fitters tool kits	10	20000
9.	Accessories like cali- pers, V-Block height gauges, steel rules, scribers etc.	LS	50000

(B) Sheet Metal Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Metal Sheer (Lever type)	4	3000
2.	Sheet Bending Machine	1	2500
3.	Drilling Machine (Pillar type 12 mm capacity)	1	4000
4.	Doall Machine	1	8000
5.	Pipe Bending Devices	1	2000
6.	Mechanical, Power Oper- ated press (5 ton capacity)	1	15000
7.	Fly Press	1	1000
8.	Pipe threading devices	1	2000
9.	Guillatine Shear	1	5000
10.	Seaming & Swaging equipemnt	LS	5000
11.	Tools & Accessories	LS	5000
12.	Miscellaneous	LS	2000

(C) Painting Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Scrapers	30	1000
2.	Brushes (Including wire type)	30	2000
3.	Spary Painting Plant (Including air compre- ssor)	1 SET	6000
4.	Other Equipment	LS	4500
5.	Miscellaenous	LS	2000

(D) Wood & Laminate Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Work benches fitted with carpenter vices (1 m x 2 m)	30	70000
2.	Wood turning lathe	8	100000
3.	Wood planer	2	60000
4.	Circular saw grinder	2	15000
5.	Wood cutting band saw	2	30000
6.	Band saw blade brazing unit	2	20000
7.	Bench grinder	2	10000
8.	Tool, Accessories, mea- suring & marking instr- uments, pattern makers scales	70 SETS	70000
9.	Drilling Machine	2	16000
10.	Other equipment	LS	30000

ELECTRICAL MACHINE LAB

1.	Laboratory D.C. power supply (220 V) static converter input from 3 phase 50 Hz, 415 volts A.C., output rating of 200-260 V, 50 amps, continuously varibale.	1	30,000
2.	Diesel generator set 3 phase, 415 volts, 15 kva, 50 Hz, diesel generator set, with suitable control pannel, for a stabilized supply including metering for voltage, current frequency, fuel level storage fuel tank of 200 litre capacity 12/24 volt battery for starting the engine, battery charger mounted on trolley wheels. (Silent Type)	1	35,00,00
3.	D.C. motor generator set two identical 220 V, 1 KW 1500 rpm. compound d.c. machines with all terminals of armature, series field, shunt field separately mounted for independent connections. D.C. motor starter, field control rheostat suitable for above machines. brushes, commutator should he vissible for study purposes.	1	15,000
4.	D.C. shunt motor 220 V, 3 KW, 1500 rpm dc shunt motor with 3 point starter and ponybrake loading arrangement with loading drum, spring balance with belt.	1	10,000
5.	D.C. series motor 220 V, 3 KW, 1450 rpm dc series motor with drum controller starter and pony brake loading arrangement with loading drum spring balance with belt.	1	10,000
6.	Compound motor 220 V, 3 KW, dc 1500 rpm compound motor with 4 point starter and pony brake loading arrangement with loading drum, spring balance with belt.	1	10,000
7.	Single phase transformer 1 KVA, 50 Hz, Pr 230 V with a tapping at 50% and 86.6% secondary - 230 V with tappings at 50% and 86.6%	1	5000
8.	3 Phase variable inductive loading unit rating 400 V, 50 Hz, 0-10 Amps.	1	8000

9.	3 Phase variable capacitive loading unit: rating 400V, 50 Hz, 0-10 Amps.	1	5000
10.	3 Phase squirrel cage induction motor rating 415 V, 50 Hz, 1440 rpm 3 KW with star/Delta starter, Automatic Y/D, Starter & with Single Phase Preventor	1	1,2000
11.	Starters for squirrel cage induction motor suitable for 3KW, 415V, 50 HZ, 1440 rpm		
	a. Star/delta automatic	1	5000
	b. Star/delta manual	1	3000
12.	Starter for squirrel cage induction motor 3KW, 415 V, 50 Hz, 1440 rpm direct on line	1	3000
13.	Starter for slip ring induction motor 3 KW, 415 V, 50 HZ, 1440 rpm auto transformer starter with automatic protection for over loading and single phasing with roter resistance Starter	1	5000
14.	Static speed control unit for 3 phase induction motor 3 KW, 425, 0-1500 rpm.	1	5000
15.	3 Phase alternator coupled to d.c. compound motor 3 phase 415 V, 50 Hz, 1500 rpm, 3 KVA star connected alternator, field excitation 110 V dc with field regulator prime mover d.c. compound wound motor, 220 V, 3.5 KW, 1500 rpm with starter and shunt field regulator	2	50,000
16.	3 Phase synchronous motor (induction start) rating 3 KW, 3 phase, 1500 rpm, 50 Hz 415 v A.C. supply with d.c. exciter mounted on the shaft of motor with suitable starter.	1	15,000
17.	Capacitor start single phase induction motor 230 V, 50 Hz 1440 rpm, 500 watts.	1	2500
18.	Repulsion induction motor 230 V, 50 Hz, 1440 rpm, 500 W	1	2500
19.	Universal motor 230 V, 50 Hz, 1440 rpm, 500 w.	1	2500
20.	Shaded pale induction motor 230 V, 50 Hz, 1440 rpm, 500 W	1	2000
21.	Analog multimeter moving coil, input impedence 1 M ohm per volt, frequency 40-400 Hz, d.c. voltage 30 mv - 1000 V a.c. voltage 100 mv - 1000 V, ac and dc	1	1000

	current 10mA - 10 A resistance 0 - 10 M Ohms with power supply battery and connecting leads.		
22.	Clipon ammeter/voltmeter measuring ranges current 0 - 12 - 50 A voltage 0 - 500 V	2	4000
23.	Clipon watt meter for measurement of active and reactive power with ranges current 10/30 A voltage 30/150/1500 V power 1 Kw	1	3000
24.	Clip on power factor meter measuring ranges capacitive 0.5 - 1.0 inductive 0.5 - 1.0 rated voltage 100/200/400 V rated current 5 A - 25 A	1	3000
25.	Moving iron ammeter-portable scale length 150 mm range		
	a. 0 - 2.5 - 5 A	2	2000
	b. 0 - 5 - 10 A	2	2000
	c. 0 - 10 - 20 A	2	2000
26.	Moving coil ammeter portable scale length 150 mm range		
	0 - 1 - 2 A	2	2000
	0 - 2.5 - 5 A	2	2000
	0 - 5 - 10 A	2	2000
	0 - 10 - 20 A	2	2000
27.	Moving iron volt meter portable		
	a. 0 - 10 V	1	1000
	b. 0 - 15 V - 30 V	1	1000
	c. 0 - 75 V - 150 V	1	1000
	d. 0 - 150 - 300 V	2	2000
	e. 0 - 300 - 600 V	2	2000
28.	D.C. moving coil voltmeter - portable		
	a. 0 - 5 - 10 V	1	1000
	b. 0 - 15 -30 V	1	1000
	c. 0 - 75 -150V	1	1000
	d. 0 - 150-300V	2	2000
	e. 0 - 300-600V	2	2000
29.	Wattmeter single phase dynamometer type portable suitable for 45-55 Hz range		
	a. 75/300/600 V 2.5/5 A	2	5000
	b. 75/150/300 V 5.0/10 A	2	5000
	c. 150/300/600 V 15/30 A	2	5000
	d. 0 -150 - 300 V 0 - 2.5/5 A	2	4000
30.	Watt meter 3 phase induction type 2 element voltage range 0/300/600 V	2	2000

	current range 0/5/10 A		
31.	Frequency meter - portable (pointer type) 45-55 Hz	2	2000
32.	Frequency meter - portable (Reed type) 45-55 Hz with 21 reeds	2	2000
33.	Frequency meter digital portable 3.5 digit LED display range 20-99 Hz	2	2000
34.	Phase sequence indicator (Rotary) 3 phase, 415 V, 50 Hz	2	1000
35.	Phase sequence indicator (Indicating type) 3 phase, 400 V, 50 Hz	2	1000
36.	Galvanometer centre zero response time 1.8 sec.	2	1000
37.	Power factor meter - single phase low current portable 0.5 capacitive to 0.5 inductive current - 20 amps voltage - 250 V frequency - 50 Hz	2	2000
38.	P.F. meter - single phase portable range 0.1 capacitive to 0.1 inductive current 2.5 amps voltage 230 V frequency 50 Hz	2	2000
39.	Power factor meter 3 phase range 0.5 capacitive to 0.5 inductive current - 10 amps, Voltage 414 V, 50 Hz	2	2000
40.	VAR meter 1/5 A, 300/600 V	2	2000
41.	Synchroscope - portable 230 V, 50 Hz	2	3000
42.	Loading rheostat single phase a. 240 V, 2.5 KW, trolley type resistance type b. 240 V, 6 KW insteps of 0.25	2 2	3000 3000
43.	Lamp load 3 phase 415 V, 6 KW	2	2000
44.	Water load 3 phase 415 V, 5 KW	2	2000
45.	Variable inductive load 415 V, 0-10 A, 50 Hz	2	5000
46.	Capacitor bank 415 V, 0-10 A, 50 Hz trolley mounted	2	4000
47.	Wire wound rheostats 15 ohms, 10 A	3	1200

	100 ohms, 5 A	3	1200
	250 ohms, 5 A	3	1200
	1000 ohms, 0.5 A	3	1200
	2500 ohms, 0.1 A	3	1200
48.	Stop watch least count 0.01 Sec.	3	2000
49.	Stop watch (digital) LED	3	2000
50.	Single Phase Induction Motor 1/2 HP, 230V 50 Cyl., 1400 RPM	3	3000
51.	3 Phase Slip ring type induction motor (Wound Rotor Type), 440V, 50 C/S, 5 HP with manually operated variable rotor resistance starter, suitable star connector variable resistor	1 set	20000
52.	Break drum loading arrangement suitable for 5 HP motor with spring balance, belt fitted on iron frame, etc, complete with panel board consisting amp. meter (MI) 10A, Voltmeter (MI) 600V and suitable TPICNL switch .	1	10000

BASIC ELECTRICAL ENGINEERING AND CIRCUIT ANALYSIS LAB

Sl. No.	Equipment	Qty.	Price
1.	Ammeter -dynamometer type portable, moving coil, permanent magnet 150 mm uniform scale		
	a. Range 0 - 2.5 - 5 Amp.	4	4000
	b. Range 0 - 50 m A	2	1500
	c. Range 0 - 500 mA	4	6000
2.	Ammeter - moving iron type Portable moving iron permanent magnet, 150 mm uniform scale		
	a. Range 0 - 5 Amp.	4	5000
	b. Range 0 - 10/20 Amp.	4	5000
	c. Range 0 - 500 mA/1000 mA	4	5000
3.	Voltmeter dynamometer type portable moving coil permanent magnet 150 mm uniform scale		
	a. Range 0 - 5/10 V	4	3000
	b. Range 0 - 15/30 V	2	2500
	c. Range 0 - 50 mv/100 mv	2	2500
	d. Range 0 - 125/500 V	2	2500
	e. Range 250/500 V		
4.	Digital multimeter 3.5/4.5 digit - display D.C. voltage 0 - 1000 V in 5 steps A.C. voltage 0 - 750 V in 5 steps Resistance 0 - 20 M ohm in 6 steps D.C. 0 - 10 A in 6 steps A.C. 0 - 10 A in 6 steps Power supply 9 V.	2	7000
5.	Analog multimeter (Portable) D.C. Voltage 0 0 1000 V AC Voltage 0 2/5/10/25/100/250/1100 V. Resistance 0 200 M ohm DC 0 - 50 micro Amp./1 mA/10 mA/100mA/1A/10A AC 0 - 100 mA/1A/25 A/10A	2	3000
6.	Wattmeter single phase (LPF= 0.2) portable dynamometer type, scale 150 mm current range 0 - 5/10 Amps voltage Range 0 - 250/500 V	4	15000
7.	Decade resistance box single dial 10x10, 10x100, 10x1000, 10x10,000 ohms	2	2500
8.	Decade capacitance box Continuously variable 0 - 1000 micro farad, 250 V	2	4000
9.	Energymeter single phase induction type, industrial grade 5 A or 10 A, 250 V, 50 Hz.	2	6000
10.	Power factor meter dynamometer type, eddy current	1	15000

damping, 50 Hz, scale length 150 mm
range upto 20 amp, voltage range
300 V 10 F. range 0.5 log, unity 0.5 load.

11. Rheostat		
sliding rheostats wound with evenly oxidised iron free nickel copper on vitreous enamelled round steel tube 150 ohms 2 Amps.	2	1500
110 ohms 2.5 Amps.	2	1500
12. Battery charger	2	5000
12 V silicon bridge rectifier AC input 230 V, DC output suitable for charging 6 V And 12 V batteries provided with MC voltmeter 0 - 20 V and ammeter 0 - 5 A		
13. LCR meter (digital)	2	20000
3.5 digit display capacitance 0 to 20,000 microfarad inductance 0 to 200 Henry resistance 0 to 20 M ohms		
14. Transformer single phase	2	12000
core type, 230/110 V, 1 KVA, 50 Hz.		
15. Laboratory D.C. power supply (220 V)	2	150,000
static converter input from 3 phase 50 Hz, 415 volts A.C., output rating of 200 watts to 260 watts, 50 amps, continuously varibale.		
16. Capacitor start single phase induction motor 230 V, 50 Hz 1440 rpm, 500 watts.	2	8000
17. Lamp load 3 phase 415 V, 6 KW	2	7000
18. Stop watch (digital)	4	6000
LED		

POWER ELECTRONICS LAB
INDUSTRIAL DRIVES AND CONTROL LAB

1. Experimental Kit For VI characteristics of SCR	5	10000
2. Experimental Kit of RC firing circuit of SCR	5	10000
3. Experimental Kit of UJT firing circuit of SCR	5	10000
4. Experimental Kit of SCR as a switch	5	10000
5. Experimental Kit of a Power Transistor as a switch	5	10000
6. Experimental Setup to study the speed control of separately excited dc motor	2	25000
7. Experimental Setup to study the speed control of single phase induction motor	2	25000
8. Experimental setup to study the speed control of three phase induction motor	2	25000
9. Experimental setup to study the speed control of three phase slipring induction motor	2	25000
10. Experimental setup to study the speed control of separately excited dc motor using MOSFET/IGBT chopper	2	25000
11. CRO Dual Trace 100 MHz	4	20000
12. Single Phase Variac 5 Amp	4	5000
6. Misc.	LS	30000

ELECTRICAL DRAFTING IN AUTOCAD

S.NO.	DISCRIPTION	QTY.	APPROX.COST	(Rs.)
1	Desktop PC- Intel Core i5-2600 8MB Cache or better, Intel Q67 Express or higher on OEM Mother Board 4 PCI(PCI/PCI Express) 2GB 1066 MHz DDR3 RAM with 8 GB Expandability, 320 GB 7200 rpm Serial ATA HDD or higher, 47cm (18.5 inch) larger LED/TFT Digital Colour Monitor, 8X or Better DVD ROM Drive 10/100/1000 on based intergrated Network Port	15	675000.00	
2.	Server-(Intel RXeonR E3-1200(4 core, 1 3.1 GHz, 8MB, 80W, 122/t) 2 GB Memory PC3-10600E DDR3, 4 DIMM slots(1) 10/100/1000 (Gigabit) RJ45 Ethernet 2 Prots, Non Hot Plug 3.5 inch SAS; Non-Hot plug 3.5 INCH sata; Hot Plug SFF SAS; Hot plug SFF SATA, (1) Integrated 6 Port Sata Raid, Micro ATX Tower (4U) or Higher Configuration	1	125000.00	
3.	Intel Core i5 or i7-720QM Processor (1.6 GHz, upto 2.8 GHz with Turbo Boost, 6 MB Cache) Intel PM55 Chipset Motherboard, Dedicated 1 GB Nvidia Geforce GT230M Graphics Card, 4GB (1066 MHz) DDR3 RAM, 500 GB Sata HDD or Higher DVD Writer, Wi-Fi 802, 11 b/g/n Bluetooth, 5-in-1 Card reader, Webcam, HDMI Port, Altec Lansing Stero Speakers, Weight 2.87 KG.		65000.00	
4.	UPS 800VA Capacity 800 VA, Range/ Frequency (50HZ+5%) 135-300 V AC/ 50Hz+5% voltage/Transfer time 230 V+9% AC/<6%, Automatic Voltage regulation/pulse width modulation 7.2 Ah* 2(in built) size 300X125X170 MM weight(Approx.), 11 Kg. Operating Temperature/Rel. Humidity 0Degree C. to 48 Degree C. OR Computer of latest Specification	16	56000.00	
5.	Laser Jet-A4 All In one 20 page per min (2 Each)	01	25,000	
6.	Digitizer	01	30,000	
2.	Software :			
i.	Noval Netware/NT Latest Version	01	55000	
ii	WINDOWS - XP/WINDOWS 2000 /Windows NT Window 7	01	6000	

iii.	MS OFFICE XP	01	17000
iv.	Dos latest version.	01	5,000
v.	FoxPro 2.5 or Latest Version	01	10000
vi.	AUTOCAD LATEST VERSION	01	40000
3.	5 KVA on line UPS with minimum 30 minute battery backup along with sealed maintenance free batteries. Provision for connecting external batteries.	01	150000
4.	Window Air Conditioner 1.5 tons capacity with ISI mark along with electronic voltage stablizer with over voltage and time delay circuit	04	150000
5.	Room preparation and furniture	LS	150000
6.	Vaccume Cleaner	02	15000

ELECTRONICS LABORATORY

Electronic Components And Devices Lab

S.No.	Name of the Equipment/ Board/Kit Etc.	Elex. Components & Devices Lab.		Rate per Piece	Total Cost	
		Intake 60	75		In Rs.	Intake 60
1.	Audio Oscillator (20HZ-50KHZ)	4	5	3500	91000	98000
2.	Multimeter, 20 K. Ohm per volt Sensitivity, + 1% accuracy d.c. voltage 1000 v. max.	4	5	2500	25000	35000
3.	Digital Elex. multimeter. 3.5/4.5/5.5 Digit Led, AC & DC Voltage Current, Frequency, Resistance, Capacitors, DC Voltage Accuracy +0.005 AC Voltage + 0.1	14	16	4500	108000	121500
4.	Regulated Power Supply 0-30 V, 0.5/1 Amps.	10	12	4000	80000	88000
5.	Multi output Power Supply 0-30V 1 Amp. 0-+-12 V, 1 Amp., 5 V. 2 Amp.	4	5	3500	21000	24500
6.	Dual Trace C.R.O. (0-30 MHz) Operating Mode Channel I, Channel II, Channel I & II, Accuracy +3, Hold off-variable control for stable triggering slope +ve or -ve, sensitivity Int, 0.5 div, Ext 0.8v, Trace Rotation- Adjustable on Front Panel, Interface-USB	4	5	30000	480000	540000
7.	Digital MultiMeter/Micro Meter Digital Millivoltmeter (Suitable range)	4	9	600	4800	5400
8.	D.C. Voltmeter /D.C. Milliamme- ter/D.C. Micrometer (suitable range)	30	40	600	18000	21000
9.	Experimental Kit/ Teaching Modules/ Training boards/ Learning kits. of relevant subject.	2* + 30	3* + 40	50000	100000	100000
10.	Component Storage rack	4	4	8000	128000	128000

S.No.	Name of the Equipment/ Board/Kit Etc.	Elex. Components & Devices Lab.		Rate per Piece	Total Cost	
		Intake 60	75		In Rs.	Intake 60
11.	Consumable Items	LS	LS	--	30000	30000
12.	Miscellaneous	LS	LS	--	50000	50000
13.	Power Operated Drilling Machine	2	3	3500	7000	10500
14.	Servo Voltage Stablizer 5 KVA	1	2	75000	75000	150000
15.	Invertor 1 KVA with Battery	1	2	15000	15000	30000
16.	One Desk Top Core i5/i7 -760 Processor, Genuine Window-7 Professional, 18 inch HD,Flat Panel MOnitor, Optical Mouse Key Board and All related media Or Latest Version	2	3	40000	80000	120000
17.	Electronics Software For Electronics Lab Virtual Lab/ Circuit Maker etc. of Latest Version	LS	LS	--	300000	300000

Communication Engineering Lab

S.No.	Name of the Equipment/ Board/Kit Etc.	Communica- tion Engg. Lab		Rate per Piece	Total Cost	
		Intake 60	75		In Rs.	Intake 60
1.	Audio signal generator 20 Hz -50 KHz, 15 V. p.p, 60 db step attenuator	6	7	4500	54000	72000
2.	Digital A.C. voltmeter True RMS type with lowest full scale range 200 MV & accuracy 1%	4	5	3500	42000	49000
3.	Analog Multimeter with 20 K Ohm /Volt 1% accuracy in DC voltage measurable 2500 V DC, Max. Res- istance 20 M Ohm, AC current range also available	2	3	3500	14000	21000
4.	Hand held Digital Multimeter 3 & 1/2/4.5 digit 0.3% accuracy 1000 V DC & 20 M. Ohm ranges Protected against transients	2	3	3500	14000	21000
5.	Dual Trace Oscilloscope 25 MHz 60 MHz, 5 MV sensitivity	2	3	20000	40000	60000
6.	Standard RF signal generator (AM/FM) Frequency range upto 110 MHz and output at least 10 MV with external modulation facility % modulation and deviation variable.	4	5	18000	72000	90000
7.	Regulated power supply 0-30 v, 0-1 Amp. 0.1% regulation short circuit and overload protected	2	3	3500	21000	28000
8.	R.F Signal generator (AM), 30 MHz, 10 MHz, External Mod. variable modulation	10	14	3000	30000	42000
9.	Transistor Radio Receiver 2 band portable, battery cum mains	4	5	800	3200	4000
10.	Transistor Radio Table Model battery cum mains	4	5	1500	6000	7500
11.	TV Antenna, 3 element and yagi (1 each) Set	-	-	800	1600	1600

S.No.	Name of the Equipment/ Board/Kit Etc.	Communica- tion Engg. Lab		Rate per Piece	Total Cost	
		Intake 60	75		In Rs.	Intake 60
12.	Radio Antenna Directional and Omnidirectional	2	2	500	1000	1000
13.	Experimental Kit of reactance tube/balanced modulator	6	8	2000	12000	16000
37.	Consumable(Not specified above)	LS	LS	LS	20000	25000

Principles of Digital Electronics Lab
Microprocessors And Microcontroller Lab

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of Digital Eltx. Lab.		Micropro- cessors & Microcon- troller Lab		Total		Total No. Recommen- ded		Rate per Piece @ Rs.	Total Cost	
		Intake		Intake		Intake		Intake			Intake	
		60	75	60	75	60	75	60	75	60	75	60
1.	CRO dual trace with delayed time base, 25 MHz or higher band width.	2	2	-	-	4	4	4	4	25000	100000	100000
2.	Multimeter, 20 K Ohm/volt sensitivity, 1% accuracy in D.C. voltage range, Max. D.C. voltage range 2500 V, A.C Current.	4	6	-	-	6	10	6	8	3500	21000	28000
3.	Multimeter, Digital hand held 3.5/4.5digit, 0.3% accuracy 1000 V D.C. and 20 m ohm resistance range protected against transients.	4	6	2	4	8	14	8	10	3500	28000	35000
4.	Logic Probe	30	35	10	15	40	50	40	50	500	20000	25000
5.	Logic board/trainer including +5 Volt, 1Amp + 15 V, 0.3 Amp. power supply and bread board and flexible leads.	20	28	-	-	20	28	20	28	5000	100000	140000
6.	Microprocessor trainer kits with 8085 system (EC 85 or similar).	-	-	16	20	16	20	16	20	12000	192000	240000
7.	Component rack 144 tray (small) & 24 large tray.	4	4	2	2	6	6	6	6	8000	48000	48000
8.	Consumable material such as components ICs, resistors transistors etc.	LS	LS	LS	LS	LS	LS	LS	LS	--	80000	
9.	Miscellaneous	LS	LS	LS	LS	LS	LS	LS	LS	--	100000	
10.	Micro Controller Kits/PLC	LS	LS	LS	LS	LS	LS	LS	LS	--	50000	
11.	Trainer Kits of Universal Shift Register (SISO, SIPO, PIPO, PISO) Decade Counter, Universal Counter (Up, Down & Updown) & Different Flip Flops	LS	LS	-	-	LS	LS	LS	LS	--	50000	
12.	Trainer Kits of 8051 Micro-Controller	-	-	LS	LS	LS	LS	LS	LS	--	50000	
13.	Dual power supply (0-30v/.5amp)	-	-	-	-	4	6	4	6	5000	20000	30000
14.	Microprocessor Training Kit of 8086	-	-	12	15					LS	100000	
15.	Universal Data Book	1	1	1	1	1	1	1	1	5000	5000	5000

Electrical And Electronics Measurements Lab
Troubleshooting and Servicing Lab
Project

S.No.	Name of the Equipment/ Board/Kit Etc.	Electrical & Ex. Measurements Lab		Project & Troubleshooting Lab		Total		Total No. Recommended		Rate per Piece	Total Cost	
		Intake		Intake		Intake		Intake			In Rs.	Intake
		60	75	60	75	60	75	60	75	60		75
1.	D C Voltmeter (1K/2K/10K/20K Ohm per Volt)	8	8	-	-	8	8	8	8	600	4800	4800
2.	Gen.purpose multimeter	4	6	4	6	12	18	8	10	2500	20000	25000
3.	Digital Multimeter	6	8	4	6	14	20	10	12	3500	35000	42000
4.	Regulated Power Supply Variable 0-30 V; 1 A	4	6	8	10	14	18	8	10	3000	24000	30000
5.	Transistor power supply (+,-,Comm)0-30 V / 1 A variable	2	3	8	10	12	15	8	10	3500	28000	35000
6.	Unregulated power supply 0-30 V; 1 A	2	2	-	-	4	4	2	2	2500	10000	10000
7.	A.F. signal generator. Output Digital AES 75W on a BN connector, AES/EBU on terminal block connector, S/PDIF on a RCA connector and To link balanced Stereo 600 W on a Terminal block connector with power adaptor	8	10	4	6	16	22	10	12	10000	100000	120000
8.	RF signal generator Frequency Range 100KHz to 150 Mhz in seven steps, accuracy on scale +5%, RF output min 100mv (upto 30 Mhz), RMS modulation AM, Audio Frequency Range 150 Hz-1.5 KHz, Audio output 2V RMS, Ext. Audio Input 50 Hz to 20 KHz at less than IV RMS Mains 230 V	10	12	4	6	18	24	10	12	15000	100000	180000
9.	Function Generator Operating modes sine, square, triangle and DC output Frequency Range 0.1-1Mhz in seven decade steps, Variable control between steps, Frequency Accuracy +0.5% Display LCD controlled by 200V +10%, 50 Hz output voltage max 10V into 50W, attenuation two step variable	2	3	2	3	6	9	4	6	25000	100000	150000
11.	AC/DC Voltmeter (M.I.type)	4	6	-	-	4	6	4	6	600	2400	3600
12.	Dual Trace CRO 100 MHz Digital Storage oscilloscope-upto 1GSa/s Simple Rate Memory 4 Kpts or Higher, 2 Channel with additional ext. trigger input, Colour Display 15 cm(5.7 inc.) 20 automatic measurement & 4 math function including FFTs, Advance Triggering, Delayed Sweep Mode Mask Test, USB Interface For PC Connectivity	4	4	8	10	10	14	8	10	35000	280000	350000
13.	Q Meter-8 Digit LED 0.8 inch Height, Range Indicator .999 count & Status indicators Via 3 LEDs, Measuring Frequency 250 ms	2	3	-	-	2	3	2	3	8000	16000	24000
14.	RLC/Universal Bridge AC/DC Bridge	2	3	2	3	2	4	4	5	8000	32000	40000
15.	Universal Digital Freq. Counter	2	3	2	3	4	6	2	3	20000	40000	60000
16.	Distortion Factor Meter	2	2	-	-	2	2	2	2	12000	24000	24000
17.	Decade Resistance Box 4/5/6 Dials	2	3	2	3	4	6	4	6	1500	6000	9000
18.	Decade Cap. Box 4/5/6 Dials	1	2	1	2	2	4	2	3	3000	6000	9500
19.	Std. Inductance (Diff. Value)	4	6	-	-	4	6	4	6	600	2400	3600
20.	Charts, Models, displays for safety/rules etc.	-	-	-	-	LS	LS	LS	LS	--	10000	10000
21.	Digital Multimeter 4.5 Digit Display, AC/DC Voltage, AC/DC Current 20A Resistance, Capacitors	6	6	4	6	12	15	6	8	5000	30000	40000

S.No.	Name of the Equipment/ Board/Kit Etc.	Electrical & Ex. Measurements Lab		Project & Trouble Shooting Lab		Total		Total No. Recommended		Rate per Piece	Total Cost	
		Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75		In Rs.	Intake 60
	Frequency Diode Test, Transistor Test & Continuity Test											
22.	Single Phase Variac 5 Amp, 15 Amp (Oil/Air cool)	2	4	8	10	18	22	10	12	5000 av.	50000	60000
23.	Tools Kit	-	-	20 SET	30 SET	40 SET	60 SET	30 SET	40 SET	1500	45000	60000
24.	Misc. Active Components	-	-	LS	LS	LS	LS	LS	LS	--	15000	
25.	Misc. Accessories as per req.	-	-	LS	LS	LS	LS	LS	LS	--	10000	
26.	Misc. Passive components.	-	-	LS	LS	LS	LS	LS	LS	--	15000	
27.	Working Models of analog and digital equipment	-	-	-	-	LS	LS	LS	LS	--	20000	
28.	Dark room with Camera, Enlarger, Developing setup, Fixing & Printing setup etc.	-	-	LS	LS	LS	LS	LS	LS	--	80000	
29.	Manual Etching Setup	-	-	LS	LS	LS	LS	LS	LS	--	10000	
30.	Mechanised Etching Setup	-	-	LS	LS	LS	LS	LS	LS	--	10000	
31.	Silk-Screen Printing Setup	-	-	LS	LS	LS	LS	LS	LS	--	10000	
32.	Drill Machine Power Operated	-	-	4	6	4	8	4	6	3500	14000	21000
33.	PCB Drill Machine	-	-	4	6	6	9	4	6	500	2000	3000
34.	Soldering Gun	-	-	2	3	2	3	2	3	2000	4000	6000
35.	Misc. Items	-	-	LS	LS	LS	LS	LS	LS	--	80000	

LEARNING RESOURCE MATERIALS

1.	LCD Projector with Screen	1	--	20000
2.	Handicam	1	--	30000
3.	Cutting, Binding & Stitching equipment.	1	--	30000
4.	Desk Top Computer with Internet Core i5/i7- 760, Processor, Genuine Windiw 7, Professional 18 inch HD, Flat Panel Monitor Optical Mouse, Key Board & all related media or latest version	1	--	40000
5.	Home Theater Support Disc type CD. CDR/CDRW DVDR/DVDRW, VCD Supported with USB Port Support-DIVX/JPEG/MP3	1	--	25000
6.	Commerical P A System 16 W-220W output, AC & 24V DC Operated, 5 Mic. & 2 Auxilary input, Speaker output 4 Ohm, 8 Ohm, 17 V & 100 V	1	--	20000
7.	Interactive Board	1	--	50000

ote :

1. This center will be only one at the institute level irrespective of all branches.

ANNEXURE-I QUESTIONNAIRE

INSTITUTE OF RESEARCH, DEVELOPMENT AND TRAINING, U.P., KANPUR -208024

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holders in Electrical And Electronics Engineering

PURPOSE: To revise Three Year diploma curriculum in Electrical And Electronics Engineering

NOTE: 1. Please answer the questions to the points given in the questionnaire.
2. Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1. Name of the organisation: _____

2. Name & Designation of the officer _____
filling the questionnaire _____

3. Name of the department/section/
shop _____

4. Important functions of the _____
department/section/shop _____

5. Number of diploma holder employees
under your charge in the area of _____
Electrical And
Electronics Engineering

6. Please give names of modern equipment/machines handled by a
diploma holder in Electrical And Electronics Engineering

1.	2.	3.
4.	5.	6.

7. What proficiencies are expected from a diploma holder in
Electrical And Electronics Engineering

1.	2.	3.
4.	5.	6.

8. Mention the approximate percentage of the following desired in
Diploma teaching.

18. Kindly mention particulars regarding topics/areas which should be given more emphasis in the curriculum .

Theory

Practical

19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field. Yes/ No
If yes : Please give names of experts in your organisation to whom contact.
20. Kindly give your valuable suggestions for being considered at the time of finalisation of curriculum.
21. What changes in technologies are to be incorporated in the development of curriculum in Electrical And Electronics Engineering

(Signature)

Kindly mail the above questionnaire duly filled to:-

Lital Kumar
HOD Electronics
Institute of Research, Development & Training, U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential for the use of curriculum design only)

ANNEXURE - II

FORMAT FOR INDUSTRIAL TRAINING

1. Name & Address of the unit
2. Date of
 - i. Joining.
 - ii. Leaving.
3. Nature of Industry
 - i. Product.
 - ii. Services.
 - iii. Working Hrs.
4. Sections of the unit visited and activities there in.
5. Details of machines/Tools & instruments used in working in the section of the unit visited.
6. Work procedure in the section visited.
7. Specifications of the product of the section and materials used.
8. Work of repair and maintenance cell.
9. Details of the shops (welding, Foundary, Machine shop etc) related to repair and maintenance work.
10. Name of checking and Inspecting Instruments and their details. Quality controls measures taken.
11. Details of hadraulics/pneumatic/thermal units or appliances used if any.
12. Discription of any breakdown and its restoring.
13. Use of computer - if any.
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygeinic.