

CURRICULUM FOR THREE YEAR
(SIX SEMESTER)
DIPLOMA COURSE IN

=====
:ELECTRONICS & COMMUNICATION ENGG. :
: Effective from Session :
=====

=====
UNDER DEVELOPMENT
=====

=====
: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

=====
: BOARD OF TECHNICAL EDUCATION :
: U.P. LUCKNOW, :
:CORRECTED AS SYLLABUS COMMITTEE OF:
: B.T.E. MEETING HELD ON 04.05.2017:
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Corrected and Approved By B.T.E. on Dated 04-05-2017

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

(Common With Electronics Engineering and Instrumentation & Control Engineering)

I SEMESTER

Curriculum						Scheme of Examination										
Periods Per Week						Theory					Practical					Grade
Le	Tut	Dr	Lab	Work	Tot	Examination	Sess.	Total	Examination	Sess.	Total	Tot				
c.	ori	aw	Shop	al		Dur.	Marks	Marks	Dur.	Marks	Marks	Marks	al			
4	-	-	-	-	4	1.1 Foundational Communicaton	2.5	50	20	70	-	-	-	-	70	
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	
4	1	-	-	-	5	1.4 Engineering Mechanics & 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	
4	-	8	-	-	12	1.6 Technical Drawing.	3.0	50	20	70	-	-	-	-	70	
22	5	8	6	-	41	<-----TOTAL----->	--	300	120	420	--	80	40	120	540	
Games/NCC/Social and Cultural Activity + Discipline (15 + 10)													25			
Aggregate													565			

II 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
6	-	-	-	-	6	2.3 Applied Chemistry	2.5	50	20	70	-	-	-	-	70
2	-	-	5	-	7	2.4 Introduction TO Computer	--	--	--	--	3	60	30	90	90
6	-	-	4	-	10	2.5 Electrical Engineering-I	2.5	50	20	70	3	60	30	90	160
-	-	-	-	12	12	2.6 Elementary Workshop Practice.	--	--	--	--	4	70	30	100	100
20	2	-	13	12	47	<-----TOTAL----->	--	200	80	280	--	230	110	340	620
Games/NCC/Social and Cultural Activity + Discipline (15 + 10)													25		
Aggregate													645		

- NOTE:-
- (1) Each period will be 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
ELECTRONICS & COMMUNICATION ENGINEERING
(Common With Electronics Engineering)

(Effective From)

III SEMESTER

Curriculum						Scheme of Examination										
Periods Per Week						T H E O R Y					P R A C T I C A L					G r a d e
Le	Tut	Dr	Lab	Work	Tot	Examination	Sess.	Total	Examination	Sess.	Total	Total	Tot			
c.	ori	aw	Shop	al		Dur.	Marks	Marks	Dur.	Marks	Marks	Marks	al			
al																
5	2				7	3.1 Applied Mathematics-II	2.5	50	20	70	--	--	--	70		
6			4		10	3.2 Electrical Engineering-II	2.5	50	20	70	3	40	20	60		
6			4		10	3.3 Electronic Devices And Circuits.	2.5	50	20	70	3	40	20	60		
6			4		10	3.4 Industrial Electronics & Transducers.	2.5	50	20	70	3	40	20	60		
				6	6	3.5 Electronics Workshop.	--	--	--	--	4	100	40	140		
23	2		12	6	43	<-----TOTAL----->	--	200	80	280	--	220	100	320		
												Games/NCC/Social and Cultural Activity + Discipline (15 + 10)		25		
													Aggregate		625	

IV SEMESTER

IV SEMESTER

4					4	4.1 Functional Communication	2.5	50	20	70	--	--	--	70	
5	1		4		10	4.2 Programming In C & C++	2.5	50	20	70	3	60	30	90	
5	1		4		10	4.3 Networks, Filters & Transmission Lines.	2.5	50	20	70	3	40	20	60	
5			4		9	4.4 Principles of Communication Engineering.	2.5	50	20	70	3	40	20	60	
5			5		10	4.5 Principles of Digital Electronics	2.5	50	20	70	3	40	20	60	
3			2		5	4.6 Energy Conservation	2.5	50	20	70	3	20	10	30	
27	2		19		48	<-----TOTAL----->	--	300	120	420	--	200	100	300	
												Games/NCC/Social and Cultural Activity + Discipline (15 + 10)		25	
													Aggregate		745

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 and supervised, branch specific, task oriented industrial/field exposure to be organised After IV Semester. Student will submit a report. There will be 60 marks for this exposure. These marks will be awarded by project examiner in the VI Semester (Examination marks : 40, Sess. marks : 20).
- (6) Field visit and extension lectures are to be organised and managed well in advance at institute level as per need.

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

(Effective From)

V SEMESTER

Curriculum						Scheme of Examination									
Periods Per Week						T H E O R Y			P R A C T I C A L			G R A D U A T I O N			
Le	Tut	Dr	Lab	Work	Tot	Examination	Sess.	Total	Examination	Sess.	Total	End	Tot		
c.	ori	aw	Shop	al		Dur.	Marks	Marks	Dur.	Marks	Marks	al	al		
al															
-	-	-	4	-	4	5.1 Integrative Communication	2.5	--	--	3	40	20	60	60	
6	2	-	-	-	8	5.2 Industrial Management and Entrepreneurship Development	2.5	50	20	70	--	--	--	70	
5	1	-	6	-	12	5.3 Electronic Instruments And Measurement.	2.5	50	20	70	3	60	30	90	
5	1	-	6	-	12	5.4 Audio And Video Engg.	2.5	50	20	70	3	60	30	90	
6	-	-	6	-	12	5.5 Optical Fibre Engg.	2.5	50	20	70	3	60	30	90	
22	4	-	22	-	48	<-----TOTAL----->	--	200	80	280	--	220	110	330	
												Games/NCC/Social and Cultural Activity + Discipline (15 + 10)	25		
												Aggregate	635		

VI SEMESTER

4	-	-	-	-	4	6.1 Environmental Education * & Disaster management	2.5	50	--	--	--	--	--	
6	2	-	8	-	16	6.2 Microprocessor And Application.	2.5	50	20	70	3	60	30	90
8	-	-	6	-	14	6.3 Modern Communication System	2.5	50	20	70	3	60	30	90
5	1	-	-	-	6	6.4 Wireless & Mobile Communication	2.5	50	20	70	-	--	--	70
-	-	-	8	-	8	6.5 Project -i. Problem ii. Field Exposure	--	--	--	--	3	90	40	130
23	3	-	22	-	48	<-----TOTAL----->	--	150	60	210	--	250	120	370
												Games/NCC/Social and Cultural Activity + Discipline (15 + 10)	25	
												Aggregate	605	

- NOTE:-
- | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------|
| (1) Each period will be of 50 minutes duration. | 30% Carry Over of I & II | 363 |
| (2) Each session will be of 16 weeks. | 70% Carry Over of III & IV | 959 |
| (3) Effective teaching will be at least 14 weeks. | 100% of V & VI Semester | 1240 |
| (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. | | 2562 |
| (6) (*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks. | | |

Sl.No.	Particulars	Page No.
I.	Study and Evaluation Scheme	
II.	Main Features of the Curriculum	1
III.	List of Experts	2
DETAILED COURSE CONTENTS		
1.	I Semester	
1.1	Foundational Communication	3-7
1.2	Applied Mathematics-I(A)	8-9
1.3	Applied Physics-I	10-11
1.4	Engineering, Mechanics & material	30-31
1.5	Electronic Components and Devices	16-20
1.6	Technical Drawing	21-24
2.	II Semester	
2.1	Applied Mathematics-I(B)	25-26
2.2	Applied Physics-II	27-29
2.3	Applied Chemistry	12-15
2.4	Introduction To Computer	32-34
2.5	Electrical Engineering-I	35-39
2.6	Elementary Workshop Practise	40-46
3.	III Semester	
3.1	Functional Communication	
3.2	Applied Mathematics-II	47-49
3.3	Electrical Engineering-II	50-53
3.4	Electronic Devices & Circuits	54-59
3.5	Industrial Electronics & Transducers.	60-63
3.6	Electronic Workshop	64-69
4.	IV Semester	
4.1	Functional Communication	3-7
4.2	Programming In C & C++	70-71
4.3	Network, Filters & Transmission Lines	72-76
4.4	Principles of Communication Engineering.	77-81
4.5	Principles of Digital Electronics	82-87
4.6	Energy Conservation	82-87
5.	V Semester	
5.1	Integrative Communication	
5.2	Industrial Management & Entrepreneurship Development	88-90
5.3	Electronics Instruments & Measurements	91-94
5.4	Audio And Video Engineering	95-100
5.5	Optical Fiber Engineering	101-103
6.	VI Semester	
6.1	Environmental Educaiton & Disaster Management	104-106
6.2	Microprocessor & Application	107-110

6.3	Modern Communication System	111-115
6.4	Wireless and Mobile Communication	111-115
6.5	Project -i. Problem ii. Field Exposure	116-118
4.	Staff Structure	137
5.	Space Requirement	138-139
6.	List of Equipments	140-174
7.	Learning Resources Equipment	175
8.	Annexure - 1 : Questionnaire	177-178
	Annexure - 2 : Field Exposure Schedule	179-180

MAIN FEATURES OF THE CURRICULUM

1. Title of the Course : Diploma In Electronics
And Communication System
2. Duration of the Course : Three Years(Six Semester)
3. Type of the Course : Full Time Institutional
4. Pattern of the Course : Semester System
5. Intake : 60
6. Entry Qualification : Passed High School with 35% Marks
7. Admission Criteria : State Joint Entrance
Examination

III.

LIST OF EXPERTS (SEMESTER SYSTEM)

On dated 28.4.2015 the following experts whose contribution and support in the semester system of this curriculum is a matter of obligation to I.R.D.T.

1. Shri Pramadesh Sahaya HOD G.P., Kanpur
2. Shri Pyush HOD(Electrical)G.P., Kanpur
3. Shri R. K. Srivastava Lecturer G. P., Kanpur
4. Smt Neeraj Lecturer(Elect.)G. P.,Lucknow
5. Shri Dinesh Sharma Lecturer(Elect.)I.R.D.T.,U.P.,Kanpur
6. Shri Lital Kumar HOD I.R.D.T.,U.P.,Kanpur

On dated 21.3.2017 the following experts whose contribution and support in the semester system of this curriculum is a matter of obligation to I.R.D.T.

- 1 Dr. Richa Verma Assistant Prof. U.I.E.T.,C.S.J.M.,Kanpur
2. Shri D K Maurya HOD(IC) G.P., Kanpur
3. Mohd. Qamruzzama Lecturer(Eng.) G. P., Kanpur
4. Shri S. K. Yadav Lecturer(Elx.) G. P.,Kanpur
5. Shri D. KR. Bharti Lecturer(Elect.) G. P.Deeh,Unnao
6. Shri Yogesh Singh Professor I.R.D.T., Kanpur
7. Shri Lital Kumar HOD I.R.D.T.,U.P.,Kanpur

LIST OF EXPERTS

A Curriculum Workshop for Development of Curriculum on the Subject “Energy Conservation” was held on 22nd January, 2018 at NITTTR, Chandigarh. The following participated in the workshop:-

S. No.	Name, Designation and Official address
From Field/Industries/Institutions of Higher Learning	
1.	Shri Jotinder Singh, Engineer-in-Chief(Retd.) Punjab State Power Corpn. Ltd.(PSPCL), Punjab
2.	Shri Punit Sharma, Asstt.General Manager, Electrical & Energy Management, Godrej Appliances Ltd. Mohali, Punjab
3.	Ms. Anu Singla, Associate Professor, Chitkara University, Rajpura, Punjab
4.	Shri Girish Kumar, UP New and Renewable Energy Development Authority (UPNEDA), Lucknow, U.P.
5.	Sh. Lal Ji Patel, TBO/ CDC Officer, IRDT Kanpur, U.P.
6.	Shri Ravinder Kumar, Research Assistant, IRDT, Kanpur, U.P.
From NITTTR, Chandigarh	
7.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, Coordinator

**1.1 FOUNDATIONAL COMMUNICATION
SECTION "A" (ENGLISH)**

L T P
4 - -

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
Section A English				
1.	PARTS OF SPEECH	12	-	-
2.	VOCABULARY BUILDING	05	-	-
3.	Grammar	15	-	-
4.	DEVELOPMENT OF EXPRESSION (Composition)	12	-	-
Section B Hindi				
5.	Topic 5	2	-	-
6.	Topic 6	5	-	-
7.	Topic 7	5	-	-
56		-	-	-

DETAILED CONTENTS

1. **PARTS OF SPEECH** :
 - a. Noun
 - b. The pronoun : Kinds and Usage
 - c. The adjective : Kinds and Degree
 - d. Determiner : Articles
 - e. The verb : Kinds
 - f. The Adverb : Kinds, Degree and Usage
 - g. Prepositions
 - h. Conjunctions
 - i. The Interjections
 - j. Subject: Verb Agreement (Concord)
2. **VOCABULARY BUILDING** :
 - a. Antonyms and Synonyms
 - b. Homophones
 - c. One word substitutions
 - d. Idioms and Phrases
 - e. Abbreviations
3. **Grammar**
 - a. Sentence & its types

- a. Tenses
- b. Punctuations
- c. Active and Passive voice
- d. Transformation of Sentences
- e. Synthesis of Sentences
- f. Direct and Indirect Narrations

4. **DEVELOPMENT OF EXPRESSION (Composition) :**

- a. Paragraph Writing
- b. Essay Writing
- c. Proposal Writing
- d. Letter Writing (Formal, Informal, Business, official etc.)
- f. Report Writing
- g. Note Making
- h. News Making
- i. Application Writing
- j. Minute Writing
- k. Invitation Letter Writing

SECTION "B" (Hindi)

- 5- संज्ञा, सर्वनाम, विशेषण, क्रिया विशेषण, वर्ण समास, संधि, अलंकार, रस, उपसर्ग प्रत्यय।
- 6- पत्र लेखन, निविदा संविदा, दर आमंत्रण (कोटेशन) अपील, स्वतन्त्र अभिव्यक्ति, प्रतिवेदन लेखन, प्रेस विज्ञप्ति।
- 7- वाक्य/वाक्यांश के लिए शब्द, पर्यायवाची या समानार्थी शब्द, विलोम शब्द, अनेकार्थी शब्द, शब्दयुग्म या समुच्चारित शब्द समूह, वाक्य शुद्धि (शुद्ध अशुद्ध वाक्य), मुहावरे एवं लोकोक्तियाँ।

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	-
4.	Differential Calculus-I	10	3	-
5.	Differential Calculus-II	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, Crammer'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 amplitud Demoivre 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 relation ship 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. DIFFERENTIAL CALCULUS -II :(10 Marks)
 - 5.1 Higher order derivatives, Leibnitz theorem.
 - 5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.
 - 5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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, Geo-stationary, 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). Accoustics of building defects and remedy.

1.4 ENGINEERING MECHANICS AND MATERIALS
(Common To Instrumentation & Control Engineering)

L T P
4 1 -

RATIONALE

TOPIC WISE DISTRIBUTION OF PERIODS

SL.No.	Topic	L	T	P
1.	Introduction	6	2	
2.	Force Analysis	10	3	
3.	General condition of equilibrium	10	3	
4.	Stress & Strain	10	2	
5.	Beam & Trusses	10	2	
6.	Materials & Concepts Use In Electronics	10	2	
Total		56	14	-

DETAILED CONTENTS

1. Introduction:

Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

2. Forces Analysis:

Concept of coplaner and non-coplaner forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of coplaner concurrent force system.

3. General Condition of Equilibrium:

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law

of equilibrium, moment law of equilibrium, application of above on body.

4. Stresses and strains:

Concept of stress and strain. Concept of various types of stresses and strains. Definitions of tension, compression shear, bending, torsion. Concept of volumetric and lateral strains, Poisson's ratio. Mechanical properties of MS, SS, CI Al and etc.

5. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, calculation of reaction at the support of cantilever and simply supported beams and trusses. (simple problems only)

6.A. MATERIALS & CONCEPT USED IN ELECTRONICS :

Soldering materials - Type, chemical composition and properties, Soldering alloys - Tin lead, Tin antimony, Tin silver, Lead silver, Tin zinc, Different types of flux and their properties, Properties of plastics materials, Epoxy materials for PCB (Single and multi layer board), Emulsion parameters, Film emulsion, Type of laminates (Phenolic, Epoxy, Polyester, Silicon, Melamine, Polyimide), Properties of copper clad laminates, Material (Filler, Resin, Copper Foil) Photo printing basic for double side PCB, Photo resin materials coating process materials, Screen printing and its materials Etching agent, Film processing and used materials.

(B) Soldering & Brazing:

For black Galvanised and Tincoated Iron sheet, brass and copper sheets only.

- (1) Its concept, comparison with welding as joining method and classification, electric soldering and forge soldering.
- (2) Soldering operation- edge preparation of joints, Pickling and degreasing, Fluxing, Tinning and Soldering. Wave soldering, solder mask, Dip soldering, Drag soldering,
- (3) Materials Used-Common fluxes, soft and hard solder, solder wire (Plain and Resin core) and sticks, spelters and their specifications and discription (For Identification Only), forge soldering bits.

- (4) Electric soldering iron, other soldering tools.
- (5) Common defects likely to occurs during and after soldering.
- (6) Safety of Personnel, Equipment & Tools to be observed.

1.5 ELECTRONIC COMPONENTS & DEVICES
(Common with Electronics Engineering and Computer Engg.)

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 (ICEO), 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 - "Basic Electronics & Linear Circuits" - Tata Mcgraw-Hill.
2. Malvino, A. P. - "Electronics Principles" - Tata Mcgraw-Hill.
3. Sedra, Adel S. Smith, Kenneth. C. " Micro Electronics Circuits" - Oxford University Press 5th Edition
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 lab instrument (Multimeter/CRO), etc.

1.6 TECHNICAL DRAWING:

(Common with Instrumentation & Control Engineering)

L	T	P
4	-	8

ENGINEERING DRAWING SCOPE OF THE SUBJECT :

A diploma holder in electronics is likely to be employed in industries where fabrication manufacturing, marking and servicing of electronics products & instruments are carried out. In such a job situation, he/she will come across various types of drawing of components, circuits & system. A knowledge of engineering drawing will be useful to interpret those drawing. In case he/she gets employment in documentation service in an electronics industry, he himself may have to prepare such drawing & for this work and understanding of the basis of concepts & principles involved in engineering drawing will be useful and have the necessity of this subject.

INSTRUCTIONAL OBJECTIVES :

At the end of the instruction in the subject, the learner should be able to :-

1. Draw free hand sketches of the schematic diagrams of electronic circuits, using standard symbols.
2. Prepare drawing from the rough sketches provided and/or enlarge/reduce the given drawing to the desired scale.
3. Draw exploded views of components & assemblies in preparation of service drawing.
4. Draw wiring diagram & make parts list;
5. Draw various views of the object using orthographic projection.
6. Identify the object when plan, elevation & views of the same are given .
7. Rearrange block representation of the given circuits.

Prat-1 (Mechanical Drawing)

DETAILED CONTENTS.

1. Free hand sketching :
 - 1.1 Introduction of Engineering drawing & its significance in the field of engineering.
 - 1.2 Need of standard practices in engineering drawing.
 - 1.3 Standard practice as per IS-696-1972.
 - 1.4 Free hand sketching; different types of lines, free hand lettering of different types
2. Care, handling & proper use of drawing instruments & materials:
 - 2.1 Drawing instruments.
 - 2.2 Materials used in drawing work.
 - 2.3 Sheet size, layout & planning of drawing sheet (familiarity with standard paper sizes, e.g A4, A3 & A2 and their mutual relationship).
3. Lettering techniques and practice
 - 3.1 Free hand drawing of letters & numerals in 3, 5, 8 & 12 mm series, vertical upright and inclined at 75°.
 - 3.2 Instrumental single stroke lettering in 12 mm.
4. Dimensioning Techniques :
 - 4.1 Necessity of dimensioning, appropriate methods of dimensioning, their merits and demerits, selection of proper dimensioning technique.
 - 4.2 Requirements of view for complete dimensioning.
5. Projection :
 - 5.1 Principle of Projection-I
 - (a) Recognition of objects from the given pictorial view.
 - (b) Identification of surfaces from different objects & pictorial views.
 - (c) Exercise on missing surfaces (views).
 - (d) Sketching practice of pictorial views objects given.

5.2 Principle of Projection-II.

- (a) Principle of orthographic projections.
- (b) Three views of given object.
- (c) Six views of given object.
- (d) From shapes of inclined surfaces.
- (e) Invisible lines, centre lines, extension & dimensioning lines.
- (f) Location & drawing of missing lines.

6. Sections :

- 6.1 Importance of sectioning.
- 6.2 Method of representing the section.
- 6.3 Conventional sections of different materials.
- 6.4 Types of sections ;types of breaks, aligned sections.
- 6.5 Sectioning of simple objects like brackets, pulleys etc.

7. Details & Assembly drawing :

- 7.1 Symbols used to show joints in chasis & frames.
- 7.2 Principles of detail & assembly drawing ;part cataloguing.
- 7.3 Practical exercises of drawing exploded views of machine components & making assembly drawing.

NOTE :

- 1. Whenever possible drawing work should involve examples relevant to electronics discipline.
- 2. Examples from electronics parts catalogue, views of machine electronic equipment, chasis, consoles, PCB (Printed Circuit Board) Hi Fi cabinets etc. may be used.

PART-II (ELECTRONICS DRAWING)

- 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.

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.

1.2. Active Devices:

- (a). 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.)

1.3. Telephone components :

- (a). Telephone Instrument/Components : Transmitter, Receiver, Filters & Hybrid transformer.

1.4. 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).

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

2.1 Circuit diagram of a Wein's bridge oscillator.

2.2 Circuit diagram of a Battery eliminator.

2.3 Block diagram of a typical Radio receiver.

2.4 Block diagram of an Electronic multimeter.

2.5 Circuit of Emergency light.

2.6 Circuit diagram of Voltage stabilizers.

2.7 Circuit diagram of Fan regulator.

3. Connection wiring diagrams.

3.1 Point to point pictorial.

3.2 Highway or trunk line.

3.3 Base line or air line.

Exercise on reading & interpreting of wiring diagrams.

4. Graphical Representation of Data : General concept, selection of variables & curve fitting, curve identification zero point location. Use of various graph paper and preparation of diagram from given data. Bar charts, pie graph, pictorial graph.

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

6. Given the block diagram of a TV receiver in A-1/A-2 size, reduce it to A-3 size.

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

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

PART-III (INSTRUMENTATION & CONTROL DRAWING)

Drawing of common symbols use in instrumentation and signal flow graph in control systems. (Only For Instrumentation & Control Engineering)

INSTRUMENTATION SYMBOLS :

Locally mounted instruments, Instruments at control centre, Instrument with two services, Transmitter, Pneumatic control valve, Hydraulic control valve, Solenoid valve, Safety valve, Self operated controller, Process line On-Fire sensor, Point of measurement, Fluid Pressure Line, Electric line, Pneumatic line, Capillary line, Special type of valves, Method to differentiate various process line using current, Identification table for instrumentation diagram.

Instrumentation diagram of process unit (At least two diagram should be drawn on one sheet)

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.	Integral Calculus-I	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. INTEGRAL CALCULUS - I : (14 Marks)

Methods of Indefinite Integration :-

- 1.1 Integration by substitution.
- 1.2 Integration by rational function.
- 1.3 Integration by partial fraction.
- 1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :(14 Marks)

- 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.
- 2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.
- 2.3 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	-
Total		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, Magnetic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

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

8. Junction Diode and Transistor : (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 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L T P
6 - -

Rationale:

Engineering Chemistry has profound and deep relationship with the industrial and environmental technology. This curriculum intends to impart technical knowledge alongwith productive practice to the students of the diploma engineering. The teachers are expected to guide the students in the classroom and the laboratories according to the curriculum by demonstrations and by showing relevant materials and equipments to inculcate interests in learning among students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Atomic Structure	4	-	-
2	Chemical Bonding	6	-	-
3.	Classification of Elements	4	-	-
4.	Electro Chemistry-I	7	-	-
5.	Electro Chemistry-II	8	-	-
6.	Chemical Kinetics	4	-	-
7.	Catalysis	4	-	-
8.	Solid State	4	-	-
9.	Fuels	4	-	-
10.	Water Treatment	6	-	-
11.	Colloidal State	4	-	-
12.	Lubricants	4	-	-
13.	Hydrocarbons	7	-	-
14.	Organic Reactions & Mechanism	8	-	-
15	Polymers	4	-	-
16	Synthetic Materials	6	-	-

DETAILED CONTENTS:

1. ATOMIC STRUCTURE : (3 MARKS)
Basic concept of atomic structure, Matter wave concept, Quantum number, Haisenberg's Uncertainty Principle, Shaples of orbitals.
2. CHEMICAL BONDING : (4 MARKS)
Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.
3. CLASSIFICATION OF ELEMENTS : (3 MARKS)
Modern classification of elements (s,p,d and f blcok elements), Periodic properties : Ionisation potential electro negativity, Electron affinity.
4. ELECTRO CHEMISTRY-I: (3 MARKS)
Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,
5. ELECTRO CHEMISTRY-II: (3 MARKS)
Redox reactions, Electrode potential (Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.
6. CHEMICAL KINETICS : (3 MARKS)
Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.
7. CATALYSIS : (2 MARKS)
Definition Characteristics of catalytic reactions, Catalytic promoters and poison , Autocatalysis and Negative catalysis,

Theory of catalysis, Application.

8. SOLID STATE :(2 MARKS)

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS :(3 MARKS)

Definition, its classification, high & low Calorific value. Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Diesel and Petrol), Benzol and Power alcohol. Knocking, Anti-knocking agents, Octane number and Cetane number.

Cracking and its type, Gasolining from hydrogenation of coal (Bergius process and Fischer tropesch's process)

Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.

Numerical Problems based on topics

10. WATER TREATMENT :(3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, primming and foarming in biolers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorinational, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER :(3 MARKS)

Concept of collidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, tyndal effect, Electro phoresis and coagulation. relative stability of hydrophillic and hydrophobie colloids. Protection and

protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS : (3 MARKS)

Definition, classification, Necessity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compounds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS: (4 MARKS)

A. Classification and IUPAC nomenclature of organic compounds homologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. ORGANIC REACTIONS & MECHANISM: (4 MARKS)

1. Fundamental aspects -

- A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
- B. Inductive effect, Mesomeric effect, Electromeric effect.

2.A. Mechanism of addition reaction (Markovnikov's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Craft reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.

15. POLYMERS : (3 MARKS)

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)

2. Thermosetting and Thermoplastic resins -

- A. Addition polymers and their industrial application - Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

B. Condensation polymer and their industrial application :
Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde,
Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers (Silicon)

16. SYNETHETIC MATERIALS : (4 MARKS)

A. Introduction - Fats and Oils

B. Saponification of fats and oils , Manufacturing of soap.

C. Synthetic detergents, types of detergents and its manufacturing.

3. EXPLOSIVES: TNT, RDX, Dynamite.

4. Paint and Varnish

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. Algoithm
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 ELECTRICAL ENGINEERING-I

(Common with Electronics Engineering and Computer Engg.)

L	T	P
6	-	4

RATIONALE

Electrical energy is most convenient neat and clean source of energy for industrial applications. The student is supposed to possess basic knowledge of electrical engineering materials such as conducting, non conducting, insulating, magnetic, semi conductor and some special purpose materials. Fundamental knowledge of electrostatics, electromagnetism will be helpful in understanding the performance of D.C. and A.C. circuits. To face the routine problems of world of work chapters on batteries, transients and harmonics have also been added.

TOPIC WISE DISTRIBUTION OF PERIODS

Sr. No.	Units	Coverage Time		
		L	T	P
1.	Classification	4	-	-
2.	Conducting Materials	8	-	-
3.	Insulating Materials	8	-	-
4.	Magnetic Materials	8	-	-
5.	Semi Conductor & Special Purpose Materials	8	-	-
6.	D. C. Circuits	8	-	-
7.	Electrostatics	8	-	-
8.	Electromagnetism	8	-	-
9.	A. C. Theory	8	-	-
10.	Batteries	8	-	-
11.	Transients & Harmonics	8	-	-
Total		84	-	56

DETAILED CONTENTS

45

Corrected and Approved By B.T.E. on Dated 04-05-2017

1. CLASSIFICATION:

Classification of materials into Conducting materials, Insulating materials, Semi-conducting materials with reference to their atomic structure.

2. Conducting Materials:

A. Resistivity and factors affecting resistivity such as temperature, alloying and mechanical stressing.

B. Classification of conducting materials into low resistivity and high resistivity materials. Some examples of each and their typical applications.

3. Insulating Materials:

A. Electrical Properties:

Volume resistivity, Surface resistance, Dielectric loss, Dielectric strength (Break down voltage) and Dielectric constant.

B. Chemical Properties:

Solubility, Chemical resistance, Weather ability.

C. Physical Properties:

Hygroscopicity, tensile and Compressive strength, Abrasive resistance, Brittleness.

D. Thermal Properties:

Heat resistance, classification according to permissible temperature rise, Effect of electrical overloading on the life of an electrical appliance.

E. Plastic Insulating Materials:

Classification into thermoplastic and thermosetting categories, examples of each and their typical applications.

4. MAGNETIC MATERIALS:

A. Ferromagnetism, domains, permeability, hysteresis loop- (including coercive force and residual magnetism) and magnetic saturation.

- B. Soft and Hard magnetic materials, their examples and typical applications.
5. SEMI CONDUCTOR AND SPECIAL PURPOSE MATERIALS:
- N-type and P-type materials, application of semi-conductor materials, materials used in transistor and I.C. manufacture.
6. D.C. CIRCUITS:
- (i) Ohm's law, resistivity, effect of temperature on resistances, heating effect of electric current, conversion of mechanical units into electrical units.
 - (ii) Kirchoff's laws, application of Kirchoff's laws to solve, simple d.c. circuits.
 - (iii) Thevenin's theorem, maximum power transfer theorem, Norton's theorem and super position theorem, simple numerical problems.
7. ELECTROSTATICS:
- (i) Capacitance and capacitor, definition, various types.
 - (ii) Charging and discharging of a capacitor, growth and decay of current in a capacitive circuit.
 - (iii) Energy stored in a capacitor.
 - (iv) Capacitance in terms of dimensions of parallel plate capacitor.
 - (v) Dielectric constant of material, Break down voltage of a capacitor.
 - (vi) Series and parallel connection of capacitors.
8. ELECTRO MAGNETISM:
- (i) Concept of mmf, flux, reluctance and permeability.
 - (ii) Energy stored in a magnetic field and an inductor.
 - (iii) Solution of problems on magnetic circuits.
 - (iv) Faraday's laws of electromagnetic induction, Lenz's law, Physical explanation of self and mutual inductance.

- (v) B-H curve, Hysteresis, Eddy currents elementary ideas and significance.
- (vi) Growth and decay of current in an inductive circuit.
- (vii) Force between two parallel current carrying conductors and its significance.
- (viii) Current carrying conductor in a magnetic field and its significance.

9. A.C. THEORY:

- (i) Concept of alternating voltage and current, difference between A.C and D.C..
- (ii) Generation of alternating voltage, equation of sinusoidal waveform.
- (iii) Definition and concept of cycle, frequency, Time period, amplitude, instantaneous value, average value, RMS value, peak value, form factor, Peak factor.
- (iv) Phase and phase difference, representation of alternating quantities by phasor, addition and subtraction of alternating quantities.

10. BATTERIES:

- (i) Construction of lead acid and nickel cadmium batteries.
- (ii) Charging and maintenance of batteries.
- (iii) Rating of batteries.
- (iv) Back up batteries (Lithium & Silver Oxide batteries)
- (v) Shelf life of batteries.

11. TRANSIENTS & HARMONICS:

Introduction, Types of transients, Important differential equations, First and Second order equations, Transients in R-L series circuits (D.C.), Short circuit current, Time constant, Transients in R-L series circuits (A.C.), Transients in R-C series circuits (D.C.), Transients in R-C series circuits (A.C), Double energy transients.

Fundamental wave and harmonics, Different complex waveforms, General equation of complex wave, R.M.S. value of a complex wave, Power supplied by complex wave, Harmonics in single phase a.c. circuits, Selective resonance due to harmonics,

Effect of harmonics on measurement of inductance and capacitance

ELECTRICAL ENGINEERING-I LAB:

LIST OF PRACTICALS:

1. Ohm's law verification.
2. To verify the laws of series and parallel connections of resistances i.e. to verify:-
 - (i) The total resistance in series connections.
$$R_T = R_1 + R_2 + R_3 + \dots$$
Where R_T is the total resistance and R_1, R_2, R_3 etc. are the resistances connected in series.
 - (ii) The total resistance in parallel connections.
$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$
Where R_T is the total resistance and R_1, R_2, R_3 etc. are the resistances connected in parallel. Also to conclude that the total resistance value of a parallel circuit is less than the any individual resistance.
3. To verify Kirchoff's following laws:-
 - (i) The algebraic sum of the currents at a junction is zero.
 - (ii) The algebraic sum of the e.m.f. in any closed circuit is equal to the algebraic sum of IR products (drops) in that circuit.
4. To measure the resistance of an ammeter and a voltmeter and to conclude that ammeter has very low resistance whereas voltmeter has very high resistance.
5. To verify Thevenin's and maximum power transfer theorems.
6. To find the ratio of inductance values of a coil having air core and iron core respectively and thus see that by the introduction of a magnetic material inside the coil, the inductance value of the coil is substantially increased.
7. To verify the relation:-
$$C_T = \frac{C_1 * C_2}{C_1 + C_2}$$
and
$$C_T = C_1 + C_2$$
For two capacitors, connected in series and parallel respectively.
8. To test a battery for charged and discharged conditions and to make connections for its charging.

9. To show that the range of an ammeter (d.c. and a.c.) and a voltmeter (d.c. and a.c.) can be extended with the use of shunts and multiplier.
10. To convert the given galvanometer into a voltmeter and an ammeter.

2.6 ELEMENTARY WORKSHOP PRACTICS

(Common with 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 Binding and Folding Aluminium pipes upto 12 mm. diameter.
(Exemple 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. Filling Chipped M.S job.
 3. Fitting on rectangular or wquare M.S. job.
 4. Making trangular squar or Haxagonal 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 specified creasing, folding, corner making, bending, circle cutting.	Ability to perform the 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 practic 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, Frams, various types of Trims such as	Identify commonly used state important properties estimate cost, select correct materials (s) for the given assignment.

Aluminium strips channels
corners grills.

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 spec-
ification.

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 fast-
-ening 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 limin-
-ates.

Jobs to be Made :

1. Plainning & 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, Eulers 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 separable, equations reducible to separable 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 ELECTRICAL ENGINEERING-II

(Common with Instrumentation & Control Engineering)

L T P
6 - 4

Rationale :

Electricity is said to be the life of industries. We can not think of an industry without using electricity. The electrical appliances commonly used for industrial application are Transformers, D.C. and A.C. motors and generators. therefore basic knowledge of these appliances should be known to the student to facilitate him in routine working.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	A. C. Theory	15	-	-
2.	Three Phase Supply	12	-	-
3.	Transformers	15	-	-
4.	D. C. Machines	15	-	-
5.	Synchronous Machines	15	-	-
6.	Induction Motor	12	-	-
-	-	84	-	56

DETAILED CONTENTS

1.0 A.C.THEORY

1.1 Representation of sinusoidal quantities by phasors.

1.2 Physical explanation of the phase relationship between voltage and current when sinusoidal alternating voltage is applied across:-

(a) Pure resistance,

(b) Pure inductance and

(c) Pure capacitance.

1.3 Explanation of inductive reactance, capacitive reactance and

their significance.

- 1.4 Relationship between voltage and current when alternating voltage is applied to :-
 - (a) Resistance and inductance in series,
 - (b) Resistance and capacitance in series.
- 1.5 Solution and phasor diagrams for simple R-L-C circuits (Series and parallel); Impedance, Impedance triangle, phase angle.
- 1.6 Power in pure resistance, inductance and capacitance; power in combination of R-L-C circuits; power factor.
- 1.7 Active and reactive currents and their significance; practical importance of power factor.
- 1.8 Series and parallel resonance in R-L-C circuits, Q-factor of coils and capacitance.
2. THREE PHASE SUPPLY:
 - 2.1 Elementary idea about 3-phase supply.
 - 2.2 Star and delta connection. Relationship between phase and line voltage and currents.
 - 2.3 Power and power factor in three phase system and their measurement.
 - 2.4 Comparison between three phase and single phase supply.
3. TRANSFORMERS:
 - 3.1 Principle of operation.
 - 3.2 E.M.F equation, Voltage & Current relations.
 - 3.3 Construction and applications of small transformers used in electronics and communication engg., construction of auto transformers, constant voltage transformer.
 - 3.4 Phasor diagram of a transformer on load; Definition of regulation and efficiency; Elementary idea of losses in transformer, open circuit and short circuit test.
4. D.C. MACHINES:
 - (a) D. C. Generator:

Working principle, constructional details, e.m.f equation, types of generators and their applications.

(b) D. C. Motor:

Working principle, back e.m.f., types of D. C. motor and elementary idea of their characteristics, torque equation, methods of speed control (Description only).

(c) Starters for D.C. Machines

5. SYNCHRONOUS MACHINES:

(a) Alternators:

Working principle, types of alternators, constructional details. e.m.f. equation, condition for parallel operation.

(b) Synchronous Motors:

Working principle, construction details, vector diagram, effect of excitation on armature current and power factor, synchronous condenser.

(c) Application of synchronous machines.

6. INDUCTION MOTORS:

(a) Three Phase Induction Motor:

Working principle and constructional details, types of induction motor, slip ring and squirrel cage, slip in induction motors, speed torque characteristics, starting and speed control, application of induction motors in industry.

(b) Single Phase Induction Motor:

Principle of operation and constructional details of single phase FHP induction motors (Split phase, capacitor start capacitor run, shaded pole, reluctance start, A.C. series, universal, hysteresis, servo and stepper motors their applications).

(c) Starters for Induction motors.

ELECTRICAL ENGINEERING-II LAB

List Of Experiments

1. To verify that in an A.C. circuit, the phasor sum (not the algebraic sum) of currents at any junction is zero.
2. To find the voltage-current relationship in a R-L series circuit and to measure power and power factor of the circuit.
3. To find for a filament lamp :-
 - (a) Variation of resistance with temperature.
 - (b) Variation of temperature with voltage.
 - (c) Variation of resistance with voltage.
 - (d) Variation of power with voltage.
4. To measure power and power factor in three phase system by two wattmeter method.
5. To determine the efficiency and regulation of a transformer by performing direct loading.
6. To measure the induced emf of separately excited D.C. generator as a function of field current.
7. To measure the terminal voltage of a separately excited D.C. generator as a function of load current.
8. To measure the terminal voltage of a D.C. shunt generator as a function of load current.
9. To measure the speed of a separately excited D.C. motor as a function of load torque at rated armature voltage.
10. To observe the difference in the starting current at switching on single phase capacitor start induction motor with :-
 - (a) The capacitor disconnected and
 - (b) The capacitor connected.Also to determine how to reverse the direction of rotation.
11. To start a Three Phase induction motor and to determine its slip at various loads.

12. To determine V curves of a synchronous motor.

3.3 ELECTRONIC DEVICES AND CIRCUITS

(Common with Instrumentation & Control Engineering and Computer Engineering)

L T P
6 - 4

Rationale :

Electronics has become so much closely associated with normal life and industries that basic knowledge about the active and passive devices used in electronics instrumentation has become an important tool for the middle level technical man power. Routine problems of maintenance and repair can be dealt successfully by a diploma student if he is equipped with the working and circuitry associated with different type of amplifiers, tuned voltage amplifiers, oscillators, multivibrator, tuned based circuits used in CRO, operational amplifier and waveshaping circuits.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Single Stage Amplifiers	3	-	-
2.	Multistage Transistor Amplifier	9	-	-
3.	Transistor Audio Power Amplifiers	9	-	-
4.	Feed Back Amplifiers	9	-	-
5.	Tuned Voltage Amplifiers	4	-	-
6.	Sinusoidal Oscillators	6	-	-
7.	Waveshaping Circuits	6	-	-
8.	Multivibrator Circuits	6	-	-
9.	Operational Amplifier	16	-	-
10.	Timer Ic	4	-	-
11.	Regulated Power Supply	6	-	-
12.	Introduction To Micro Electronics	6	-	-
-	-	84	-	56

DETAILED CONTENTS

1. SINGLE STAGE AMPLIFIERS:

- 1.1 Transistor hybrid low frequency model in CE configuration, 'h' parameter and their physical significance, typical values of 'h' parameters and their determination by

transistor characteristics.

- 1.2 Expressions for voltage gain, current gain, input and output impedance for a single stage CE amplifier circuit in 'h' parameters, appropriate approximations.
2. MULTISTAGE TRANSISTOR AMPLIFIERS:
 - 2.1 Need of multistage amplifier, different coupling schemes and their working, brief mention of application of each of the type of coupling.
 - 2.2 Working of R.C. coupled and transformer coupled multistage amplifier, approximate calculation of voltage gain for a two stage R-C coupled amplifier.
 - 2.3 Frequency response of R-C coupled and transformer coupled amplifiers and its physical explanation, definition and physical significance of the term as bandwidth, upper and lower cross over frequencies etc.
 - 2.4 Direct coupled amplifier and its limitations differential amplifier typical circuits diagram and its working.
3. TRANSISTOR AUDIO POWER AMPLIFIERS:
 - 3.1 Difference between voltage and power amplifier, importance of impedance matching in power amplifier, collector efficiency of power amplifier.
 - 3.2 Typical single ended power amplifier and its working, graphical method for calculation of output power, heat dissipation curve and importance of heat, sinks, class A, class B, class C amplifier (without derivation).
 - 3.3 Working principle of push pull amplifier and circuits, its advantages over single ended power amplifier, cross over distortion in class B operation and its reduction, different driver stages for push pull amplifier circuit.
 - 3.4 Working principle of complementary symmetry push pull circuit and its advantages.
 - 3.5 Boot strap technique in amplifiers.
 - 3.6 Transformer less audio power amplifiers and their typical application.
 - 3.7 Mention of at least one popular IC with its block diagram, Pin configuration and its working of each type of power amplifier.

4. FEED BACK AMPLIFIERS:
 - 4.1 Basic principle and types of feed back.
 - 4.2 Derivation of expression for the gain of an amplifier employing feed back.
 - 4.3 Effect of negative feedback on gain, stability, distortion and band width (Only physical explanation)
 - 4.4 Typical feedback circuits :
 - (a) A.C. coupled amplifiers with emitter by-pass, capacitor removed.
 - (b) Emitter follower and its application, simple mathematical analysis for voltage gain and input impedance of above circuits.
5. TUNED VOLTAGE AMPLIFIERS:
 - 5.1 Classification of amplifiers on the basis of frequency.
 - 5.2 Review of basis characteristics of tuned circuits, (Series and Parallel)
 - 5.3 Single and Double tuned amplifier, their working principles and frequency response (no mathematical derivation). Concepts of neutralization.
 - 5.4 Staggered tuned amplifier and typical applications in brief.
 - 5.5 Mention of at least one popular IC with its block diagram, Pin configuration and its working of each type of Tuned amplifier.
6. SINUSOIDAL OSCILLATORS:
 - 6.1 Application of oscillators.
 - 6.2 Use of positive feedback/negative resistance for generation of oscillation, Barkhausen's criterion for oscillations.
 - 6.3 Different oscillator circuits, tuned collector, Hartley, Colpitts, phase shift, Wien's bridge and crystal oscillator and their working principles (no mathematical derivation).
 - 6.4 Mention of at least one popular IC with its block diagram, Pin configuration and its working of each type of oscillators.
7. WAVESHAPING CIRCUITS:

- 7.1 General idea about different waveshapes.
- 7.2 Review of transient phenomena in R-C and R-L circuits.
- 7.3 R-C and R-L differentiating circuits and integrating circuits.
Their applications (physical explanation for square/rectangular input waveshapes only).
- 7.4 Diode clippers series and shunt biased type double clipper circuits.
- 7.5 Zener diode clipper circuits.
- 7.6 Use of transistor for clipping.

Diode clamping circuit for clamping to negative peak, positive peak or any other levels for different input waveforms (e.g sine, square, triangular).

8. MULTIVIBRATOR CIRCUITS:

- 8.1 Ideal transistor switch; explanation using C.E. output characteristics, calculation of component values (collector and base resistors) for a practical transistor switch.
- 8.2 Transistor switching time. Use of speed up capacitor (Physical explanation).
- 8.3 Basic concept of working of collector coupled bistable, monostable and stable multivibrator circuits including principle of triggering.
- 8.4 Operation of Schmitt trigger, calculation of upper trigger potential (UTP) and lower trigger potential (LTP).
- 8.5 Mention of applications of multivibrators and Schmitt trigger. Its use as waveform generator.
- 8.6 Transistorised voltage controlled oscillator (basic) principle only.
- 8.7 Mention of at least one popular IC with its block diagram, Pin configuration and its working of each type of Multivibrator circuits.

9. OPERATIONAL AMPLIFIERS:

- 9.1 Specifications of ideal operational amplifier and its block diagram.
- 9.2 Definition of inverting and noninverting inputs, differential voltage gain and input and output offset,

voltage input offset current, input bias current, common mode rejection ratio (CMMR), power supply rejection ratio (PSRR) and slew rate.

9.3 Method of offset null adjustments, use of op.amp. as an inverter scale changer, adder, subtractor, differential amplifier, buffer amplifier, differentiator, integrator, comparator, Schmitt Trigger, Generation of Square and Triangular Waveform, log and anti-log amplifiers, PLL and its application and IC power amplifier.

9.4 IC OP-AMP Application :

Inverting/Noninverting VCVS integrators, Differentiators CCVS and VCCS instrumentation amplifiers, Active filter (LP, HP and Notch), Oscillators. Log/Antilog modules, Precision rectifier, Peak detector, Sample and Hold Circuit, IC analog multiplier application, Analog multiplexer and demultiplexer.

10. Timer Ic.:

Block diagram of Ic timer (such as NE 555) and its working, use of 555 timer as monostable and astable multivibrator, and waveform generator.

11. Regulated Power Supply

11.1 Concept of regulation.

11.2 Basic regulator circuits (using zener diode).

11.3 Concept of series and shunt regulator circuits.

11.4 Three terminal voltage regulator Ics (positive negative and variable) application. Block diagram, Pin configuration and working of popular regulator IC.

11.5 OP-AMP regulators, IC regulators, Fixed Voltage regulators, (78/79, XX) 723 IC regulators (Current Limiting, Current Fold Back), SMPS.

12. Introduction to Microelectronics-

- Advantages of integration, Types of integrated circuits, Monolithic and Hybrid circuits.
- Different stages of fabrication of ICs- Epitaxial Growth, Oxidation and film deposition, Diffusion and Ion Implantation, Lithography & Etching. (Only brief idea of all)

- Masking, Selective doping, Fine-line lithography and isolation for Monolithic circuits.
- Introduction to monolithic device elements such as BJT, MOS, transistor and integration of other circuit elements.
- Very large scale integration (V.L.S.I.).
(Only brief idea)
- CMOS

LIST OF BOOKS

1. Bhargava, Kulshreshtha & Gupta - "Basic Electronics & Linear Circuits" - Tata Mcgraw-Hill.
2. Malvino, A. P. - "Electronics Principles" - Tata Mcgraw-Hill.
3. Sedra, Adel S. Smith, Kenneth. C. " Micro Electronics Circuits" - Oxford University Press 5th Edition

ELECTRONIC DEVICES AND CIRCUITS LAB

List of Experiment

1. To measure the overall gain of two stage R.C. coupled amplifier at 1 Khz and note the effect of loading of second stage on the first stage.
2. To plot the frequency response of R-C coupled amplifier.
3. (a) To plot the load Vs output power characteristics to determine the maximum signal input for undistorted signal output.

(b) The above experiment is to be performed with single ended power amplifier; Transistorized push; pull amplifier; Compl-ementary Symmetry power Amplifier.
4. To observe the effect of a by-pass capacitor by measuring voltage gain and plotting of frequency response for a single stage amplifier.
5. To measure input and output impedance of a feedback amplifier with and without by-pass capacitor.
6. Measurement of voltage gain input and output impedance and plotting of frequency response of an emitter follower circuit.
7. Measurement of resonant frequency, plotting of the response curve (i.e. graph between input frequency and impedance) and calculation of Q with the help of this curve for series and parallel resonant circuit.
8. To measure the frequency response of a single stage tuned voltage amplifier and calculation of the Q of the tuned circuit load.
9. Observe and plot the output waveshapes of ;

(a) R-C differentiating circuits.

(b) R-C integrating circuits for squarewave input (Observe the effect of R-C time constant of the circuits on the output waveshape for both the circuits).
10. (a) Observe the output waveforms of given biased and unbiased series and shunt clipping circuits, for positive and negative peak clipping circuits, for positive and negative peak clipping of a sine wave using switching diodes and D-C sources and compare it

with input wave.

(b) Observe the output wave shape of given double clipper circuit using diodes and D-C sources.

(c) Observe the output wave shape of given zener diode and transistor clipper circuits for positive peak, negative peak and double clipping sine (or other) waveshapes.

11. To clamp square wave to their positive and negative peaks and to a specified level.
12. To measure I_c and V_{ce} for transistor when I_b is varied from zero to maximum value and measure the value of V_{ce} and I_c for saturation at a given supply, voltage and load.
13. To test a transistor schmitt trigger circuit, observe and plot the waveshapes at various points.
14. Use of Op-Amp. (for IC-741) as Inverting and non-inverting amplifier, adder, comparator, buffer, scale changer.
15. Simple working circuits using NE555.
16. To determine the range of frequency variation of a RC phase shift oscillator.
17. To test adjustable IC regulator and current regulator.
18. Identification, Pin configuration and basic working of different popular IC's - Exm.- Power amplifier, Oscillator, Tuned amplifier, Multivibrator, Timer.

3.4 INDUSTRIAL ELECTRONICS AND TRANSDUCERS

L T P
6 - 4

Rationale :

Measurement of different parameters is required in industries to maintain the product within specified limits. The measurement can be done by direct or indirect methods. Transducers are used as sensing elements in indirect system of measurements. The student equipped with the knowledge about thyristers, optoelectronic devices will prove useful in the world of work.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Thyristers & Their Application	18	-	-
2.	Induction Heating	6	-	-
3.	Dielectric Heating	9	-	-
4.	Transducers	18	-	-
5.	Processing of Transducers Signals	12	-	-
6.	Optoelectronic Devices	21	-	-
-		84	-	56

DETAILED CONTENTS

1. THYRISTORS AND THEIR APPLICATIONS
 - 1.1 Name, symbol and typical applications of members of thyristor family.
 - 1.2 SCR, Triac and Diac-Basic structure, operation, V-I characteristics and ratings, gate circuits, ratings, triggering process and triggering circuits, turn off methods and circuits, selections of heat sinks, mounting of thyristor on heat sinks, basic idea of protection of thyristor circuits.
 - 1.3 Operation, V-I characteristics, equivalent circuit and parameters of an UJT: Description of UJT relaxation oscillator, use of UJT relaxation oscillator for triggering thyristors.

1.4 Diac SCR and Triac switching circuits like automatic battery charger, voltage regulator, emergency light, alarm circuits, time delay relay circuits and circuits for over current and over voltage protection.

1.5 Single phase, various types of phase controlled rectifiers using SCR for resistive and inductive load explanation using waveshapes and appropriate mathematical equation (No derivation).

A.C. phase control using SCRs and triacs, Application of phase controlled rectifiers and A.C. phase control circuits in illumination control, temperature control, variable speed drives using d.c. moters and small a.c. machines.

1.6 Half wave, full wave (including bridge) poly phase rectifiers using SCRs; explanation using wave shapes and formula (no derivation). Operation of three phase bridge controlled rectifier and its applications.

1.7 Principle of operation of basic inverter circuits, basic series and parallel commutated inverters, principle of operation of cycloconverter, choppers and dual converter, mention of applications.

2. PRINCIPLES AND APPLICATIONS OF INDUCTION AND DIELECTRIC HEATING (No Mathematical Treatment)

Introduction, improtance of heating in industry, Principle of induction heating, Industrial applications of induction heating, Principle of dielectric heating, Industrial applications of dielectric heating.

3. TRANSDUCERS:

Basic idea and principle of operation and their use in measuring physical parameters of the following types of transducers.

Transducer	Typical Applications
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3.1 Varible Resistance Type

Potentiometric Resistance strain gauge.	Displacement and force Torque and Displacement.
-----------------------------------------	-------------------------------------------------

Resistance Thermometer.	Temperature.
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Optic Effect, Acousto-Optic Effect.

- 5.5 Sensors & Display Devices - Optical Fiber Sensors, Display Devices, LCD display, Numeric Display.
(Only Brief description of above)

LIST OF BOOKS

1. M. H. Rashid-" Power Electronics Circuits, Devices & Application"- P.H.I
2. J. Michael Jacob - " Power Electronics : Principle and Application" - Viks Publishing House Pvt. Ltd.
3. Singh Jasprit - " Optoelectronics An Introduction to Materials and Devices" - McGraw-Hill
4. C. S. Ranjan- "Instrumentation Devices & Systems"- Tata McGraw Hill.

List Of Experiments

1. Identification of various types of packages and terminals of various low and high power thyristors (SCR and Triac).
2. To determine and plot firing characteristics of SCR :-
 - (a) By varying the anode to cathode voltage.
 - (b) By varying the gate current.
3. Observing voltage waveshapes at various points of UJT relaxation oscillator circuit.
4. Observation of waveshapes at relevant points of the circuit of a single phase controlled rectifier using SCR and UJT relaxation oscillator.
5. To determine the firing characteristics of Triac in different mode i.e. Mode-I (plus), Mode-I (minus), Mode-III (plus), Mode-III (minus).
6. Observe the waveshapes and measure a.c. and d.c voltage at various points of a three phase bridge rectifier circuit.
7. Observe the waveshapes and measure a.c. and d.c. voltage at various points of a three phase SCR controlled bridge rectifier circuit.
8. Test an a.c. phase control circuit using triac and observe waveshapes and voltages at relevant points in circuit (while using for lamp intensity control and/or a.c. fan speed control).
9. To study the working of a single phase SCR/ transistor inverter circuit by observing waveshapes at input and output.
10. To measure force and pressure by using strain gauge transducer.
11. To observe the working of crystal microphone.
12. To observe the working principle of following devices in practical circuit :-
 - (a) Light Dependent Resistor (LDR).
 - (b) Photo electric cell.

- (c) LED and LCDs.
 - (d) Avalanche Photodiode
 - (e) Optical fibre sensor
13. To measure voltages at different points of a circuit using a light sensitive device as ON-OFF control.

3.5 ELECTRONICS WORKSHOP

(Common with Instrumentation & Control Engineering and Computer Engineering)

L T P
0 0 6

PART-A ELECTRICAL WORKSHOP

GENERAL OBJECTIVES

After the completion this course the learner will be able to

1. Become familiar with domestic and semi-domestic industrial wiring practice.

INSTRUCTIONAL OBJECTIVES

After completing this course the learner will be able to

1. Plan and Wire a small domestic building given the load requirement.
2. Specify the wiring planes of semi-industrial installations with three phase supply and a maximum of 5 KVA load.

Exercises To Be Performed	No. of turns reqd.
1. Identification and study of commonly used electrical materials such as wires, cables, switches, fuses, coiling, roses, battens, cleats and allied items.	1
2. Identification and study of various tools used in Electrical Workshop and safety measures.	1
3. Making connection of single lamp and three pin plug socket to supply using batten wiring.	1

4.	Making Electrical connection for staircase wiring.	1
5.	Making Electrical connection for a tube light and door bell.	1
6.	Wire a mains outlet pannel consisting of a specified combination of 5 AMP; 15 AMP, Socket, Main switch, Indicating lamp and Fuse links.	1
7.	Given the load requirements, prepare the wiring diagram for a small Electronic/Electrical Laboratory/ Workshop using energy meter, MDB and SDBS and details of sub-circuits, Protective device, cables/wires should be specified. The wiring should assume the availability of 3 phase 4 wire mains supply near the laboratory/workshop.	2
	Total turns required	----- 8 -----

PART-B. ELECTRONICS WORKSHOP

GENERAL OBJECTIVE

After completion of instruction in this subject the student will :-

1. Develop skill in selection and use of commonly used tools, equipment, components in a given situation.
2. Develop skill in wiring, soldering and desoldering works.
3. Develop skill in tracing circuits of simple (analogue and digital) electronic assembly.

INSTRUCTIONAL OBJECTIVE

After completion of instruction in the subject the student will be able to :-

1. State the correct name and function of different tools and accessories, such as :-

Tools

Pliers, Wire cutter, Wire stripper, Tweezer, Soldering iron, Desoldering tools, Neon tester and Screw drivers.

Accessories

1. Including Tapes, Solders, Solders tips, Fluxes; De-soldering wick, Solder cleaning fluids, Sleeves, Tags.
2. Demonstrate the correct use of accessories mentioned in (1) above.
3. Selection and use of general purpose Electronic test and measuring equipemnt :-
 - 3.1 Given any of the wavefrom generators specified in equipment type (a) below with its controls set at random, the student should be able to operate/adjust the necessary control to demonstrate/any desired waveform on the appropriate measuring equipment, specified in (b) below.
 - 3.2 Given any measurement equipment specified in (b) below (with its controls set at random) the student should be able to operate adjust the necessary controls to measure/display electrical parameter(s) such as specified on the right side margin.

Parameter for being measures:
Amplitude, Frequency phase
Time Period, Rise and Fall
time of pulse Wavefrom,common
transistor parameters,circuit
resistance.
 - 3.3 Given different type of power supply mention in (c), the student should be able to find out the operating range and regulate the power supplies

Equipment Type.

- (a) Test Wavefrom Generator :- Audio oscillator, Function Generator, Signal Generator, Spectrum Analyzer.
 - (b) Measurement Equipment ; Single beam CRO, Double beam/ Dual trace CRO, electronic and Digital multimeters, Transistor tester/Curve tracer, IC tester etc.
 - (c) Power Supply - UPS, Invertor, Different types of DC/AC power supplies
4. Students should be able to identify and use the item mention below (a), (b), (c) and (d).
 - (a) Various types of Single/Multicores, Insulated screened, Power type/ Audio/ Video/ General purpose wires and

cables.

(b) Various types of plugs, sockets, connectors suitable general purpose audio, video use. Some of such connectors are : Banana plug and Sockets, ENC, DIN, UHF, VHF, Earphone connectors, Telephone jacks and similar male and female connectors and terminal strips.

(c) Various types of switches such as : Normal/miniature Toggle, Slide, Push button, Piano key rotary, SPST, DPDT, Band selector multiway, Master main switch.

(d) Various types of protective devices such as : Wire fuse, Cartridge fuse, Single/Multiple miniature circuit breakers over and under current relays.

5. Exercises to be performed :

i. Study and testing of different types of Resistor, Capacitor, Inductor, Diode, Transistor (BJT, FET, MOS, CMOS) and ICs (All Popular Families).

ii. Study of different processes by performing in assembling-Soldering, Desoldering, Cutting, Stripping and connecting.

iii. Study of equipment - their control and operation mentioned in no. 3 part of accessories.

iv. Study of the items mentioned in part 4-a,b,c,d by using them in different types of circuits.

v. Students should design and assemble at least seven working circuits (Full Fabricated Form) selecting at least three from each group A and B given below

Group A

1. Single Stage Amplifier
2. Halfwave and Full Rectifier
3. Filters
4. RC Coupled Amplifier
5. Power Amplifier (Push Pull)
6. Tuned Amplifier
7. Oscillator
8. Waveshaping Circuits

Group B

1. Clap Switch
2. Door Bell
3. Burglar Alarm

4. Porch Light
5. Water level Indicator
6. Fan regulator
7. .25 Kva Manual Stabilizer
8. Single band transistor radio receiver

Note :

1. The above list of Group B suggestive, more items may be added to the list depending upon students choice and materials availability but the item should belong consumers interest category.
2. Student should be encouraged for self market survey for each material.

PART-C PREPARATION OF PRINTED CIRCUIT BOARDS

Instructional Objective

*

After the completion of instruction in this area of the subject the learner will be able to :-

1. Acquire skill in silk screen printing techniques for the purpose of making the printed circuit boards.
2. Acquire knowledge of non dry-method of PCB making using photoprocessing techniques.
3. Acquire skill in preparing, checking, drilling and proper storing PCBs.

Suggested Task/Exercises

No. of turns
required.

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1. Familiarisation with tools, equipment, materials and processes of a single and double sided PCB making using direct etching method (Artwork to be done by students) . | 1 |
| 2. As above exercise using photoprocessing techniques. The initial exposure is to include the following | 2 |

2.1	Dark Room Practice.	
	(a) Exposure using UV light/daylight	
	(b) Developing (including dye developing)	
	(c) Fixing	
	(d) Printing (including contact printing)	
	(e) Enlarging/Reducing	
2.2	Techniques of photo-resist coating.	
2.3	Baking and cleaning procedures.	
2.4	Etching procedures.	
2.5	Procurement and storage of materials and equipment.	
2.6	Safety rules for PCB laboratory and darkroom.	
3.	Exercises in making simple single and double sided PCB using direct etching method.	2
4.	Exercises in making single and double sided PCB using photoprocessing method.	2
5.	Familiarisation with tools equipments, materials and process of silk screen printing for PCB making.	2
6.	Exercises in PCB making using silk screen printing techniques.	2
7.	Exercises in drilling, assembling and testing of single and double sided PCB; proper storage of PCBs.	1
	Total Turns Required	----- 12 -----

4.1 Functional Communication

L	T	P
4	-	-

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
Section A English				
1.	On Communication	04	-	-
2.	Exploring Space	04	-	-
3.	Sir C.V. Raman	04	-	-
4.	Professional Development	04	-	-
5.	Buying a Second Hand Bicycle	04	-	-
6.	Leadership and Supervision	04	-	-
7.	First Aid	03	-	-
8.	The Romanance of Reading	03	-	-
9.	No Escape from Computers	03	-	-
10.	Bureau of Indian Standards	03	-	-
Section B Hindi				
1.	Topic 1	02	-	-
2.	Topic 2	02	-	-
3.	Topic 3	02	-	-
4.	Topic 4	02	-	-
5.	Topic 5	02	-	-
6.	Topic 6	02	-	-
7.	Topic 7	02	-	-
8.	Topic 8	01	-	-
9.	Topic 9	02	-	-
10.	Topic 10	02	-	-
11.	Topic 11	01	-	-
		56	-	-

Section "A" (English)

Text Lessons

Unit I.	On Communication
Unit.II	Exploring Space
Unit.III	Sir C.V. Raman
Unit.IV	Professional Development of Technicians
Unit.V	Buying a Second Hand Bicycle
Unit.VI	Leadership and Supervision
Unit.VII	First Aid
Unit.VIII	The Romanance of Reading

Unit.IX No Escape from Computers
Unit.X Bureau of Indian Standards

Section "B" Hindi

- 1- स्वरोजगार
- 2- भारतीय वैज्ञानिकों एवं तकनीकियों का भारत के विकास में योगदान
- 3- ग्राम्य विकास
- 4- परिवार नियोजन
- 5- सामाजिक संस्थायें
- 6- नियोजन और जन कल्याण
- 7- भारत में प्रौद्योगिकी के विकास का इतिहास
- 8- हरित क्रान्ति
- 9- पर्यावरण एवं मानव प्रदूषण
- 10- श्रमिक कल्याण
- 11- भारत में श्रमिक आन्दोलन

4.2 PROGRAMMING IN C & C++

(Common to Instrumentation & Control Engg.)

L	T	P
5	1	4

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.	Classes & Objects	20	4	
3.	Programming in C++	20	4	
-		70	14	56

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. CLASSES & OBJECT:

What is a class, what is an object, constructors, types of object (external, automatic static, Dynamic objects) Metaclass, role of meta class. Scope of classes, array of objects, objects as a function argument.

4. Programming in C++:

What is object-orientation, area of object technology, C++, getting to grips with C++ (data types, escape sequence, characters, variables, operator, notation, Arrays, Function conditional statements, call by value, call by reference, Pointer : C++ memory map, dynamic allocation pointers, pointers with arrays, Structure, structure with arrays, passing, structure of function, Enumerated data types, Inheritance, apolymorphism & Overloading.

PROGRAMMING IN C & C++

List of Experiments

1. Exercises involving output and input format controls in Pascal.
2. Exercises involving control transfer statements in C & C++
3. Exercises with arrays & Pointers in C & C++.
4. Exercises with functions in C & C++.
5. Exercises with files in C & C++.

4.3 NETWORK, FILTERS AND TRANSMISSION LINES

(Common with Instrumentation & Control Engineering)

L	T	P
5	1	4

Rationale :

The electronic circuits are too much complicated. To understand the working of electronic circuitary a systematic knowledge of the tools of circuit analysis is required. A student having knowledge of the basic tools like network theorems one port/two port network, symmetrical/asymmetrical network, attenuators, filters and transmission lines will be able to share any type of responsibility in the industry atmosphere.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Review of Network Theorms	5	1	-
2.	Networks	12	2	-
3.	Symmetrical & Asymmetrical Network	15	3	-
4.	Attemuators	6	2	-
5.	Filters	12	2	-
6.	Transmission Lines	20	4	-
-		70	14	56

DETAILED CONTENTS

1. REVIEW OF NETWORK THEOREMS:

Review of the following, network theorem; superposition, Thevenin's Norton's and maximum power transfer.

2. NETWORKS:

2.1 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.

2.2 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.

3. SYMMETRICAL AND ASYMMETRICAL NETWORK :

3.1 Symmetrical Network :

- (a) Concept and significance of characteristics impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
- (b) Expression for characteristic impedance, propagation constant, attenuation constant and phase-shift constant in terms of Z_0 , Z_{oc} and Z_{sc} for the following
 - (i) T Network.
 - (ii) π Network.

3.2 Asymmetrical Network :

- (a) Concept and significance of iterative impedance image impedance, image transfer constant and insertion loss.
- (b) The half section (L-section) : Splitting of symmetrical T & π sections into half sections, derivation of iterative impedance, image impedance open and short circuit impedance of half section.

3.3 Star-Delta Transformation : Equivalence of T and π network.

4. ATTENUATORS:

4.1 Units of attenuation (decible and nepers)

4.2 General characteristics of attenuators.

4.3 Analysis and design of simple attenuator of following types

- (a) Symmetrical T and π type.

(b) L type.

5. FILTERS:

5.1 Brief idea of the uses of filters networks in different communication system.

5.2 Connecting of low pass, high pass, band pass and band stop filters.

5.3 Theorem connecting attenuation constant α and characteristics impedance (Z_0) determination of cut off frequency constant K section.

5.4 Prototype filter section

(a) T and n low pass filter section.

- Reactance frequency characteristics of low pass and its significance.
- Attenuation Vs frequency; phase shift Vs frequency characteristics impedance Vs frequency of T and n.
- Simple design problems of prototype low pass section.

5.5 Active Filter:

Basic Concept of active filter and comparison with passive.

(a) Op. amp. integrator circuit, basic low pass active filter, First and Second order low pass Butter worth filter - Frequency response.

(b) Op. amp. differentiator circuit, basic high pass active filter, First and Second order high pass Butter worth filter- Frequency response.

(c) Basic concept of band pass filter, Wide and narrow band pass active filter.

(d) Basic concept of band reject filter, wide and narrow band reject filter.

(e) All pass filter, Frequency response

5.6 Crystal Filter :

(a) Crystal and its equivalent circuit.

(b) Design properties of piezoelectric filters and their use.

5.7 Equalizers :

General Introduction.

6. TRANSMISSION LINE:

- 6.1 Transmission lines and their application : Shapes of different types of transmission lines; including 300 ohm antenna feeder cable, 75 ohm co-axial cable, optical fibre cable, Also other different types of cables.
- 6.2 Distributed (or primary) constants of a transmission line equivalent circuit of infinite line;
- 6.3 Necessity of the concept of an infinite line; Definition of characteristic impedance of line ; concept of short line termination in Z_0 currents no voltages long an infinite line; graphical representation; propagation constant, attenuation and phase shift constant of the line.
- 6.4 Relationship of characteristics impedance, propagation constant, attenuation constant and phase constant in term of distributed constants of the line, smith charts.
- 6.5 Conditions for minimum distortion and minimum attenuation of signal on the line; necessity and different methods of loading the communication lines.
- 6.6 Concept of reflection and standing waves on a transmission line; definition of reflection coefficient in terms of characteristics impedance and load impedance; Definition of standing wave ratio (SWR), relation between VSWR and voltage reflection coefficient, maximum impedance on a line in term of characteristics impedance and VWSR.
- 6.7 Transmission line equation; expression for voltage, current and impedance at a point on the lines for lines with and without losses. Expression for the input impedance of the line. Solving Transmission line problems using Smith Chart.
- 6.8 Input impedance of an open and short circuited line and its graphical representation.
- 6.9 Transmission line at high frequency, effect of high frequencies on the losses of a transmission line; Application of transmission line as a reactive components and impedance transformer (e.g. quarter wave and half wave transformer).
- 6.10 Principle of impedance matching using single stub; comparison of open and short circuit stubs.

6.11 Expression for characteristic impedance of open wire and coaxial lines (No derivation).

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.

List Of Experiment

1. Experimental verifications of the Thevenin's and Norton's theorem with an a.c. source.
2. Experimental verifications maximum power transfer theorem.
3. To measure the characteristics impedance of a symmetrical T/n (π) network.
4. To measure the image impedance of a given asymmetrical T/n (π) networks.
5. To design and measure the attenuation of a symmetrical T/n(π) type attenuator.
6. For a prototype low pass filter :
 - (a) Determine the characteristics impedance experimentally.
 - (b) Plot the attenuation characteristics.
7. For a prototype high pass filter :
 - (a) Determine the characteristics impedance experimentally.
 - (b) To plot the attenuation characteristic.
8. (a) To plot the impedance characteristic of a prototype band pass filter.
 - (b) To plot the attenuation characteristic of a prototype band pass filter.
9. (a) To plot the impedance characteristic of m-derived low pass filter.
 - (b) To plot the attenuation characteristic of a m-derived high pass filter.
10. To design 1st order and 2nd order active LPF filter using IC 741 and draw the frequency response curve.
11. To design 1st order and 2nd order active HPF filter using IC 741 and draw the frequency response curve.
12. Measurement of characteristics of a short transmission line.
13. Measurement of L & C of lossless transmission line.

- 14 Measurement of Z_0 of lossless transmission line.
15. Measurement of Attenuation of lossless transmission line.
16. Measurement of Velocity of Propagation in lossless transmission line.

4.4 PRINCIPLES OF 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	2	-	-
3.	Frequency Modulation	2	-	-
4.	Phase Modulation	3	-	-
5.	Pulse Code Modulation	5	-	-
6.	Principle of A.M. Modulators	5	-	-
7.	Principle of F.M. Modulators	5	-	-
8.	Demodulation of A.M. Waves	5	-	-
9.	Demodulation of F.M. Waves	8	-	-
10.	Transmitters	8	-	-
11.	Radio Receivers	8	-	-
12.	Antenna & Wave Propagation	9	-	-
13.	Communication Media	3	-	-
14.	Modems & Multiplexers	5	-	-
-		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).
- 1.4 Types of Noise, Internal & External Noise, Noise In AM & FM System (Brief Idea)
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.
 - 2.4 Vestigial side band modulation and its application.
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. PULSE CODE MODULATION
 - 5.1 Elementary idea of sampling theory and pulse modulation; Shanon's theorem and coding technique, Quantization (Brief idea only).
 - 5.2 Time Division and frequency division multiplexing, CDMA, WDMA, FDMA and TDMA (Brief Idea Only).
 - 5.3 PCM system, Types of PCM and its application.

- 5.4 Digital Modulation Techniques (ASK, FSK, PSK, DPSK) (Brief Idea Only).
- 6. PRINCIPLE OF AM MODULATORS
 - 6.1 Working principles and typical application of
 - Collector Modulator.
 - Base Modulator.
 - Balanced Modulator.
 - 6.2 Single-Side-Band (SSB) generation and its typical applications.
- 7. PRINCIPLE OF FM MODULATORS
 - 7.1 Working principle and applications of reactance tube modulator, varactor diode modulator and armstrong phase modulator.
 - 7.2 Limiter, pre-emphasis and de-emphasis in FM communication system.
- 8. DEMODULATION OF AM WAVES
 - 8.1 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).
 - 8.2 Comparison of typical diode detector circuits in a Radio and TV receiver.
- 9. DEMODULATION OF FM WAVES
 - 9.1 Basic principles of detection of FM waves.
 - 9.2 Foster-seely discriminator and its working principles.
 - 9.3 Working of Ratio-detector circuit and its advantage over Foster-seely discriminator circuits.
 - 9.4 Basic principle of Quadrature detection.
- 10. TRANSMITTERS
 - 10.1 Classification of transmitters on the basis of power, frequency and modulation.
 - 10.2 Block diagram of an AM transmitters and working of each stage. Low level and High level modulation.

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

11. RADIO RECEIVER

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

11.2 Block diagram of super-heterodyne AM receiver, function of each block and typical waveforms at the input and output of each block.

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

12. ANTENNA AND PROPAGATION

12.1 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.

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

12.3 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.

12.4 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.

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

12.6 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.)

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

13. Communication Media:- Telephone Lines, Twisted Pair Wire, Co-axial Cable, Fibre optics.
14. Modems - Basic working principle of modems and their application
15. Multiplexers- Digital Multiplexers- Synchronous and Asynchronous (Brief Idea Only).

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

PRINCIPLE OF COMMUNICATION ENGINEERING LAB

List Of Experiments

1. (a) To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation.
(b) To measure the modulation index of the wave obtained in above experiment.
2. (a) To obtain an AM wave from a collector modulator circuit and observe the Am pattern on CRO.
(b) To measure index of modulation of the AM signal for different level of modulation signal.
3. To obtain a FM wave from reactance tube modulator/voltage controlled oscillator (using 8038 or 566) circuit and measure the frequency deviation for different modulating signal.
4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion.
5. To obtain modulating signal from a FM detector (Foster-seely/ Ratio detector/quadrature detector) Circuit (or using 2211 or PLL 565) and plot the detector characteristics.
6. To obtain AM-SB from Balanced modulator.(BM025 may be used).
7. To detect AM-SB by using SSB detector. (SL 640C may be used).
8. To identifying different stages of radio receiver and IC used at each stage and plot the sensitivity characteristics of a radio receiver and determination of the frequency for maximum sensitivity.
9. To plot the selectivity characteristics of a radio receiver.
10. To plot the fidelity characteristics of a radio receiver.
11. (a) To plot the radiation pattern of directional and omndirectional antenna.

(b) To plot the variation of field strength of radiated wave, with distance from a transmitting antenna.
12. Tuning and alignment of radio receiver.
13. Circuit tracing and fault finding of different stages of radio receiver.
14. Simple demonstration, ASK, FSK and PSK through training kits

NOTE :- Antenna simulator developed by TTTI can be used for this experiment.

4.5 PRINCIPLE OF DIGITAL ELECTRONICS

(Common with Instrumentation & Control Engineering)

L T P
5 - 5

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	6	-	-
5.	Logic simplifications	6	-	-
6.	Logic Families & Digital ICs	6	-	-
Part2- Combinational Logic Circuits				
7.	Arithmetic operations	6	-	-
8.	Encoder, Decoders & Display Devices Associated Circuits, Multiplexer & Demultiplexer	6	-	-
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	4	-	-
14.	Arthametic Circuits	4	-	-
-		70	-	70

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 method of subtraction.

3. CODES, CODE CONVERSION AND PARITY:

3.1 The 8421 and excess-3 codes; mention of other popular 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 to tempole 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 commerical 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 convertors.
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 commerical 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 parrallel 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- Prentic
Hall (India)

PRINCIPLE OF DIGITAL ELECTRONICS-LAB

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.

4.6 ENERGY CONSERVATION

L T P
3 - 2

RATIONALE

The requirement of energy has increased manifold in last two decades due to rapid urbanization and growth in industrial/service sector. It has become a challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as an additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

DETAILED CONTENTS

1. **Basics of Energy**
 - 1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
 - 1.2 Global fuel reserve
 - 1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
 - 1.4 Impact of energy usage on climate
2. **Energy Conservation and EC Act 2001**
 - 2.1 Introduction to energy management, energy conservation, energy efficiency and its need
 - 2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
 - 2.3 Standards and Labeling
 - 2.3.1 Concept of star rating and its importance
 - 2.3.2 Types of product available for star rating
3. **Electrical Supply System and Motors**
 - 3.1 Types of electrical supply system
 - 3.2 Single line diagram
 - 3.3 Losses in electrical power distribution system
 - 3.4 Understanding Electricity Bill
 - 3.4.1 Transformers Tariff structure
 - 3.4.2 Components of power (kW, kVA and kVAR) and power factor, improvement of power factor

3.4.3 Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

3.5 Transformers

- 3.5.1 Introduction
- 3.5.2 Losses in transformer
- 3.5.3 Transformer Loading
- 3.5.4 Tips for energy savings in transformers

3.6 Electric Motors

- 3.6.1 Types of motors
- 3.6.2 Losses in induction motors
- 3.6.3 Features and characteristics of energy efficient motors
- 3.6.4 Estimation of motor loading
- 3.6.5 Variation in efficiency and power factor with loading
- 3.6.6 Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

4.1 Pumps

- 4.1.1 Introduction to pump and its applications
- 4.1.2 Efficient pumping system operation
- 4.1.3 Energy efficiency in agriculture pumps
- 4.1.4 Tips for energy saving in pumps

4.2 Compressed Air System

- 4.2.1 Types of air compressor and its applications
- 4.2.2 Leakage test
- 4.2.3 Energy saving opportunities in compressors.

4.3 Energy Conservation in HVAC and Refrigeration System

- 4.3.1 Introduction
- 4.3.2 Concept of Energy Efficiency Ratio (EER)
- 4.3.3 Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5 Lighting and DG Systems

5.1 Lighting Systems

- 5.1.1 Basic definitions- Lux, lumen and efficacy
- 5.1.2 Types of different lamps and their features
- 5.1.3 Energy efficient practices in lighting

5.2 DG Systems

- 5.2.1 Introduction
- 5.2.2 Energy efficiency opportunities in DG systems
- 5.2.3 Loading estimation

6 Energy Efficiency in Thermal Utilities

6.1 Thermal Basics

- 6.1.1 Types of fuels
- 6.1.2 Thermal energy
- 6.1.3 Energy content in fuels
- 6.1.4 Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces

- 6.2.1 Introduction and types of boilers
- 6.2.2 Energy performance assessment of boilers
- 6.2.3 Concept of stoichiometric air and excess air for combustion
- 6.2.4 Energy conservation in boilers and furnaces
- 6.2.5 Do's and Don'ts for efficient use of boilers and furnaces

6.3 Cooling Towers

- 6.3.1 Basic concept of cooling towers
- 6.3.2 Tips for energy savings in cooling towers

6.4 Efficient Steam Utilization

7 Energy Conservation Building Code (ECBC)

- 7.1 ECBC and its salient features
- 7.2 Tips for energy savings in buildings
 - 7.2.1 New Buildings
 - 7.2.2 Existing Buildings

8 Waste Heat Recovery and Co-Generation

- 8.1 Concept, classification and benefits of waste heat recovery
- 8.2 Concept and types of co-generation system

9 General Energy Saving Tips

Energy saving tips in:

- 9.1 Lighting
- 9.2 Room Air Conditioner
- 9.3 Refrigerator
- 9.4 Water Heater
- 9.5 Computer
- 9.6 Fan, Heater, Blower and Washing Machine
- 9.7 Colour Television
- 9.8 Water Pump
- 9.9 Cooking
- 9.10 Transport

10 Energy Audit

- 10.1 Types and methodology
- 10.2 Energy audit instruments
- 10.3 Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

5.1 INTEGRATIVE COMMUNICATION

L	T	P
-	-	4

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction to Personality Development	-	-	02
2.	Factors Influencing / Shaping Personality	-	-	02
3.	Self Awareness - 1	-	-	03
4.	Self Awareness - 2	-	-	02
5.	Self Awareness - 3	-	-	02
6.	Change Your Mind Set	-	-	02
7.	Interpersonal Relationship and Communication	-	-	03
8.	Non-Verbal communication Communication Skills	-	-	02
9 .	Communication Skills ACTIVITIES	-	-	06
10.	Body Language skills	-	-	03
11.	Leadership Traits & Skills	-	-	03
12.	Attitude	-	-	03
13.	Analyzing & Solving a Problem skills	-	-	02
14.	Time Management skills	-	-	03
15.	Stress Management Skills	-	-	02
16.	Interview Skills	-	-	04
17.	Conflict Motives	-	-	02
18.	Negotiation / Influencing Skills	-	-	02
19.	Sociability	-	-	03
20.	Importance of Group	-	-	03
21.	Values / Code of Ethics	-	-	02
-		-	-	56

PERSONALITY DEVELOPMENT

1 Introduction to Personality Development

AIM, Skills, Types of Skills, LIFE SKILLS VS OTHER SKILLS, Concept of Life Skills. Ten core Life Skills identified by

WHO

2. Factors Influencing / Shaping Personality :

Introduction, Physical and Social Factors Influencing / Shaping

Personality (Hereditary, Self-Development, Environment, Education, Life-situations) Psychological AND Philosophical Factors Influencing / Shaping Personality (Past Experiences,

Dreams and Ambitions, Self-Image, Values)

3. Self Awareness - 1

DIMENSIONS OF SELF AWARENESS (Self Realization, Self Knowledge or Self Exploration, Self Confidence, Self Talk, Self

Motivation, Self Esteem, Self Image, Self Control, Self Purpose, Individuality and Uniqueness, Personality, Values, Attitude, Character), SELF REALIZATION AND SELF EXPLORATION THROUGH SWOT ANALYSIS AND JOHARI WINDOW,

4. Self Awareness - 2

SYMPATHY VS EMPATHY AND ALTRUISM, Importance of Empathizing with Others,

5. Self Awareness - 3

Self-Awareness through Activity, Body Image (What is Body Image, What Decides our Body Image, What is Poor Body Image, What are the Harmful Effects of Poor Body Image), Tackling Poor Body Image(Enhance Self-Esteem, Build Up Critical Thinking, Build up Positive Qualities, Understand Cultural Variation, Dispel Myths, Utilize Life Skills)

6. Change Your Mind Set

What is Mindset, HOW TO CHANGE YOUR MINDSET (Get the Best Information Only, Make the best people your Role Model, Examine Your Current Beliefs, Shape Your Mindset with Vision and Goals, Find Your Voice, Protect Your Mindset, Let Go of Comparisons, Put An End To Perfectionism, Look At The Evidence, Redefine What Failure Means, Stop Worrying About What "People" Think)

INTERPERSONAL SKILLS

7. Interpersonal Relationship and Communication

INTERPERSONAL RELATIONSHIP , Forms of Interpersonal Relationship, Must Have in an Interpersonal Relationship, Interpersonal Relationship between a Man and a Woman (Passion, Intimacy, Commitment), Relationship Between Friends, ROLE OF COMMUNICATION IN INTERPERSONAL RELATIONSHIP (Take Care Of Your Tone And Pitch, Choice of Words is Important in Relationships, Interact Regularly, Be Polite, Try To Understand The Other Person's Point Of View As Well, Individuals Can Also Communicate Through Emails,

8. NON-VERBAL COMMUNICATION Communication Skills

Non-Verbal Communication, We Communicate with Our Eyes, Communication with Facial Expression, A Good Gesture, Appearance, Posture and Gait, Proximity and Touch), IMPORTANCE OF LISTENING, Characteristics of Good and Effective Listener(Is Attentive, Do Not Assume, Listen for Feelings and Facts, Concentrate on the Other Speakers Kindly and Generously, Opportunities)

9. Communication Skills ACTIVITIES -

Activities in Making Collages, Making Advertisements, PPT Preparation & Presentation, Speaking -Seminars, Group Discussions, Debates, Extempore Speeches, Listening to an audio clip and telling its gist, Answering a telephone call, Making enquiries, General tips- Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, Magazines (Current Affairs, Economic magazines, Technical magazines), How to read a report, article, Writing- Resume Writing, Writing joining report, Notice writing, Report making, Proposal writing, Advertisement, Notice for tender, Minutes writing, E-Mail writing, Listening News, Listening to audio clips.(Lecture, poetry, speech, songs),

10. Body Language skills

Introduction, What is Body Language , Body Language Parts, Personal Space Distances (Intimate Distance, Personal Distance, Social Distance, Public Distance), IMPORTANT BODY LANGUAGE SIGNS AND THEIR MEANING

UNDERSTANDING OTHERS

11. Leadership Traits & Skills :

Introduction, Important Leadership Traits (Alertness, Bearing, Courage, Decisiveness, Dependability, Endurance, Enthusiasm, Initiative, Integrity, Judgment, Justice, Knowledge, Loyalty, Sense of Humour), Other Useful traits (Truthfulness, Esprit-de-corps, Unselfishness, Humility and sympathy, Tact without loss of moral courage, Patience and a sense of urgency as appropriate, Selfconfidence, Maturity, Mental including emotional stability)

12. Attitude

Types of Attitude, Components of Attitudes (Cognitive Component, Affective Component, Behavioral Component), Types of Attitudes (Positive Attitude, Negative Attitude, Neutral Attitude, Rebellious Attitude, Rational and Irrational Attitudes, Individual and Social Attitudes), Kinds of Attitude, ASSERTIVENESS, How to Develop Assertiveness (Experiment and Try New Things, Extend Your Social Circle, Learn to Make Decisions for Yourself, Indulge in Knowledge, Admire Yourself &

Others), Negotiation (Be Sensitive to The Needs Others, Be Willing To Compromise, Develop Your Problem-Solving Skills, Learn to Welcome Conflict, Practice Patience, Increase Your Tolerance For Stress, Improve Your Listening Skills, Learn To Identify Bottom-Line Issues Quickly, Be Assertive, Not Aggressive)

PROBLEM SOLVING

13. Analyzing & Solving a Problem skills

Critical Thinking, Creative Thinking, Decision Making, Goal Setting & Planning, Problem Solving

14. Time Management skills

Need of Time Management, TIME WASTERS (Telephone, Visitors , Paper work, Lack of Planning & Fire Fighting , Socializing , Indecision , TV , Procrastination), PRINCIPLES

OF

TIME MANAGEMENT - Develop a Personal Sense of Time (Time Log , value of other people's time), Identify Long-Term

Goals ,

Concentrate on High Return Activities , Weekly & Daily

Planning

(The Mechanics of Weekly Planning , Daily Planning), Make

the

Best Use of Your Best Time , Organize Office Work

(Controlling

Interruptions , Organizing Paper Work), Manage Meetings,

Delegate Effectively, Make Use of Committed Time, Manage

Your Health,

15. Stress Management Skills

INTRODUCTION, Understanding Stress and its Impact, Expected Responses (Physical, Emotional, Behavioral), stress

signals(thoughts, feelings, behaviors and physical), STRESS

MANAGEMENT TECHNIQUES (Take Deep Breath, Talk It Out,

Take A Break, Create a Quite Place in Your Mind, Pay

Attention

to Physical Comfort, Move, Take Care of Your Body, Laugh,

Mange Your Time, Know Your Limits, Do You Have To Be Right

Always, Have A Good Cry, Look for the Good Things Around

You, Talk Less, Listen More), UNDERSTANDING EMOTIONS

AND FEELINGS-through Activity

16. Interview Skills (2 sessions from Industry Expert is Compulsory)

Curriculum Vitae (When Should a CV be Used, What Information Should a CV Include, personal profile, Covering Letter, What

Makes a Good CV, How Long Should a CV Be, Tips on

Presentation), Different Types of CV (Chronological, Skills-

Based), BEFORE THE INTERVIEW , CONDUCTING

YOURSELF DURING THE INTERVIEW , FOLLOWING

THROUGH AFTER THE INTERVIEW , Interview Questions To

Think About , MOCK INTERVIEW - Activity (MOCK INTERVIEW

EVALUATION - NON-VERBAL BEHAVIORS, VERBAL BEHAVIORS, General Etiquettes to face the Board , Telephonic interview

17. Conflict Motives -Resolution

Motives of Conflict(Competition for Limited Resources, The Generation Gap and Personality Clashes, Aggressive Personalities, Culturally Diverse Teams, Competing Work and Family Demands, Gender Based Harassment), Merits and Demerits of Conflict , Levels of Conflict (Interpersonal Conflict, Role Conflict, Inter-group Conflict, Multi-Party Conflict, International Conflict), Methods of Conflict Resolution (The Win-Lose Approach, The Lose-Lose Strategy, The Win-Win Approach), Techniques for Resolving Conflicts (Confrontation and Problem Solving Leading to Win-Win, Disarm the Opposition, Cognitive Restructuring, Appeal to Third Party, The Grievance Procedure)

18. Negotiation / Influencing Skills

Why Influencing, What Is Influencing, TYPES OF INFLUENCING SKILLS (Probing And Listening, Building Rapport, Sign Posting, Pacing, Selling, Assertiveness), LAWS AND PRINCIPLES OF INFLUENCE, The Six Laws of Influence (The Law of Scarcity, The Law of Reciprocity, The Law of Authority, The Law of Liking, The Law of Social Proof, The Law of Commitment and Consistency), Influencing Principles (Making a Start, Buy Yourself Thinking Time, Dealing With Disagreement, Difficult And Sensitive Situations)

19. Sociability : Etiquettes And Mannerism & Social Skills

Need for Etiquette , Types of Etiquettes (Social Etiquette, Bathroom Etiquette, Corporate Etiquette, Wedding Etiquette, Meeting Etiquette, Telephone Etiquette, Eating Etiquette, Business Etiquette, E-Mail Etiquettes,), MANNERISMS, HOW TO IMPROVE YOUR SOCIAL SKILLS (Be Yourself, Be Responsible, Be Open & Approachable, Be Attentive, Be Polite, Be Aware, Be Cautious)

20. Importance of Group / Cross Cultural Teams / Team Work skills

Introduction, Types and Characteristics of Groups (Definition of a Group, Classification / Types of Groups, Friendship Group, Task Group, Formal Groups, Informal Group, Effective Group), Importance of a Group, Characteristics of a Mature Group, TYPES AND CHARACTERISTICS OF A TEAM (Definition of a Team, Types of Teams, Functional Teams, Problem Solving Teams, Cross - Functional Teams, Self - Managed Teams),

Importance of a Team, Characteristics of a Team

21. VALUES / CODE OF ETHICS

Meaning, A FEW IMPORTANT VALUES (Honesty, Integrity, Purity, Discipline, Selflessness, Loyalty, Fairness, Equality, Trust, Support, Respect, etc)

Note : One Orientation module for the faculty is must.
Involvement of Industry Experts is necessary for Interview Skills

5.2 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

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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.

5.3 ELECTRONIC INSTRUMENTS AND MEASUREMENTS

(Common with Instrumentation & Control Engineering)

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TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction	2	1	-
2.	Multimeters	6	1	-
3.	Electronic Multimeter	6	1	-
4.	A. C. Millivoltmeter	6	1	-
5.	Cathode Ray Oscillograph	12	3	-

6.	Audio Power Meter	6	1	-
7.	Signal Generator	6	1	-
8.	Impedance Bridges & Meters	6	1	-
9.	Regulated Power Supply	9	2	-
10.	Digital Instrument	9	2	-
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-		70	14	84
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DETAILED CONTENTS

1. INTRODUCTION TO THE PROCESS OF MEASUREMENTS:
 - 1.1 Review of the terms, accuracy, precision, sensitivity range and errors, difference between accuracy, precision and resolution.
 - 1.2 Precaution against high frequency noise pick up and remedies, shielding and grounding (two terminal and three terminals).
 - 1.3 Concept of selective wide band measurements.
2. MULTIMETERS:
 - 2.1 Principle of measurement of D.C. voltage and D.C. current, A.C. voltage and A.C. current and resistance in a multimeter.
 - 2.2 Specifications of a multimeter and their significance.
 - 2.3 Limitations with regards to frequency and impedance.
3. ELECTRONIC MULTIMETER:
 - 3.1 Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity, principles of voltage, current and resistance measurements.
 - 3.2 Specification of electronic multimeter and their significance.
4. A. C. MILLIVOLTMETER:
 - 4.1 Types of AC millivoltmeters: Amplifier-rectifier and rectifier amplifier, block diagram and explanation of the above types of A.C. milli voltmeter.
 - 4.2 Typical specifications and their significance.
5. CATHODE RAY OSCILLOSCOPE:

- 5.1 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.
- 5.2 Explanation of time base operation and need for blanking during flyback, synchronisation.
- 5.3 Block diagram and explanation of a basic CRO and a triggered sweep oscilloscope, front panel controls.
- 5.4 Specifications of CRO and their significance.
- 5.5 Use of CRO for the measurement of voltage (D.C. & A.C.) frequency using Lissajous figure, time period, phase.
- 5.6 Special features of dual trace, delayed sweep and storage CROs (Brief mention only).
- 5.7 CRO probes including current probes.
- 5.8 Working Principle of Spectrum Analyzer.
6. AUDIO POWER METER:
 - 6.1 Block diagram of an audio power meter.
 - 6.2 Principles of working its application and high frequency limitations.
 - 6.3 Scale conversion from power to db.
7. SIGNAL GENERATORS:
 - 7.1 Block diagram explanation of laboratory type low frequency and RF signal generators, pulse generator and function generator.
 - 7.2 Specification for low frequency signal generator, RF generator, pulse generator and function generator. Brief idea of testing specification for the above instruments.
 - 7.3 Standard signal generator.
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. REGULATED POWER SUPPLY:
 - 9.1 Block diagram of regulated power supply, IC based power supply.
 - 9.2 Major specifications of regulated power supply, and their measurement (line and load regulation, output ripple and transients).
 - 9.3 Basic working principles of switched mode power supply.
 - 9.4 Concept of floating and grounded power supplies and their interconnections to obtain multiple output supplies.
 - 9.5 Basic working principle of uninterrupted power supply
- 10. DIGITAL INSTRUMENTS:
 - 10.1 Comparison of Analog and Digital instruments, characteristics of digital meter.
 - 10.2 Working principle of Ramp, Dual slope and integrating type of digital voltmeter.
 - 10.3 Block diagram and working of a digital multimeter.
 - 10.4 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

ELECTRONIC INSTRUMENTS AND MEASUREMENT LAB

List Of Practicals

1. Loading effect of a multimeter and its limitations to measure high frequency voltages.
2. Measurement of Q of a coil and its dependence on frequency using a Q meter.
3. Measurement of voltage, frequency, time period, phase angle and delay time using CRO : (use of Lissajous Figures).
4. Measurement of time period, frequency, average period using universal counter frequency counter.
5. To test a power supply for ripple, line and load regulation, Tracing of wave form, To findout operating range of power supply.
6. Measurement of rise, fall and delay time using a CRO.
7. Measurement of distortion of a LF signal generator using distortion factor meter.
8. Measurement of R.L. and C using a LRC bridge/universal bridge.

5.4 AUDIO AND VIDEO ENGINEERING

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Rationale :

Audio and Video Engineering is an important media of distant audio & video communication. It finds major application in consumer electronics in the form of B/W and coloured receiver. It also plays an important role in education, research and space application. A student having knowledge about the composite video signals, TV camera tubes, TV receiver circuitry, Antenna, Booster and Feeder, Formation of colour TV signals. Their modulation and demodulation will be able to share any type of responsibility assigned to him.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Electro Acoustic Transducers	8	1	-
2.	Sound Recording	6	1	-
3.	Hi-Fi Stereo & Its System	8	2	-
4.	Introduction	8	2	-
	A. TV Communication			
	B. Scanning & Composite Video System			
5.	Camera Tube	8	2	-
6.	Picture Tube	6	1	-
7.	Fundamental of Colour Signal	8	2	-
8.	Colour Camera	2	1	-
9.	NTSC & PAL Fundamental	8	1	-
10	VDU	8	1	-
—		70	14	84

DETAILED CONTENTS

1. ELECTRO ACOUSTIC TRANSDUCERS:
 - 1.1 Microphones-carbon, condenser, moving coil, crystal, ribbon and lavalier microphones, their construction and basic working principles, frequency response, impedance, sensitivity and directional patterns, typical applications of different types of microphones. Idea of other commercial

microphones.

- 1.2 Loudspeakers-direct radiating and horn loader type their construction, working principles characteristics and applications. Baffles and Enclosures. Introduction to tweeters and woofers and crossover networks, Speakers column.

2. SOUND RECORDING:

Magnetic Recording :

- 2.1 Basic Idea about Sound Recording on Magnetic Tape and its reproduction.

2.2 Optical Recording of Sound :

Basic ideas of optical recording of sound on films and its reproduction

2.3 Digital Recording of Sound :

Basic ideas of Digital Recording and Reproduction of Sound. Basic concepts of sampling quantization, aliasing and encoding. formats of digital audio recording, basic of recording-Servo system. Material and formation of CD, Block diagram of audio CD player. Description of its main block.

3. HI-FI STEREO AND ITS SYSTEM:

- 3.1 General ideas about public address system and its block diagram.

- 3.2 Concept of Fidelity, noise and different types of distortions in an audio system. Stereophony, comparison of monophonic and stereophonic sound. Brief description of stereophonic recording on tape. Block diagram of hi-fi stereo system, Function of bass, Treble, Loudness and Balance control. Consequences of mismatch between amplifier output and speaker impedance. Need for a multi-speaker column. Cross over network in speaker columns.

4.A. INTRODUCTION TO TV COMMUNICATION:

- 4.1 Elements of telecast TV chain giving elementary idea of the role of TV camera, TV transmitter, propagation of signal, reception through antennas, TV receiver.

- 4.2 Brief mention of other types of TV communication such as CCTV, CATV, MATV, Sattelite TV and their applications.

- 4.3 Brief mention of factors affecting range of TV coverage such

as:-

- (a) Line of sight propagation.
- (b) Effect of earth's curvature.
- (c) Receiving and transmitting antenna heights.
- (d) Power of transmitter.

4.B. PRINCIPLES OF SCANNING AND FORMATION OF COMPOSITE VIDEO SIGNALS:

4.1 Basic of photoelectric conversion from scene to electrical signal through camera tube.

4.2 Sequential and interlaced scanning, line frequency field frequency.

4.3 Concept of :-

- (a) Field and Frame.
- (b) Persistence of vision and flicker.
- (c) Picture element.
- (d) Aspects ratio.

4.4 Frequency range of various bands and channels in the VHF range used in India.

4.5 Channel specifications :

4.5.1 Channel frequency limits, vision and sound carrier frequencies.

4.5.2 Need for VSB and VSB specifications.

4.5.3 Vision bandwidth, vision modulation types, sound bandwidth, sound modulation type, reasons for employing AM for vision FM for sound and negative modulation for TV transmission, Composite Video Signal.

5. CAMERA TUBES:

Basic concepts of Signal tube colour camera, its construction and working

6. PICTURE TUBE:

6.1 Basic principle of operation and working B and W picture tube, its mounting and adjustment of Yoke.

- 6.2 Brief idea about delta gun and guns in line picture tube.
- 6.3 Construction and working of single gun(Trinitron) picture tube
- 7. FUNDAMENTAL OF COLOUR SIGNAL:
 - 7.1 Basic idea about primary and complementary colour (Why, Red, Blue and Green are used as primary colour).
 - 7.2 Production of Luminance and colour difference signal.
- 8. COLOUR CAMERA :
 - 8.1 Digital colour camera system. Basic idea of construction and working.
 - 8.2 Solid state imagers.
- 9. NTSC & PAL FUNDAMENTALS:
 - 9.1 Basic principles of NTSC & PAL system.
 - 9.2 Basic principle of QAM (Quadrature Amplitude Modulation)
 - 9.3 Basic principle of PAL-S, PAL-D and Synchronous demodulation
 - 9.4 Block diagram of NTSC and PAL coder and decoder, function of each block
- 10. VIDEO DISPLAY UNITS (VDU):
 - 10.1 Block diagram and specifications of colour VDU and function of each block.
 - 10.2 Interfacing of VDU with computers.
 - 10.3 Basic idea about LCD/Plasma/LED monitor
 - 10.4 Remote controlling of Electronic Devices (Basic Idea).
 - 10.5 Basic Idea of construction and working of HDTV.
 - 10.6 Basic idea of DTH system, dish antenna

LIST OF BOOKS

- 1. A. Sharma- Audio Video & TV Engineering- Danpat rai & Sons.
- 2. Benson & Whitaker - Television and Audio Handbook- McGraw Hill Pub.
- 3. R. R. Gulati - Modern Television Practices, Principles Technologies and Services- New Age International Pub.

4. Benson & Whitaker - Television and Audio Handbook- McGraw Hill Pub.

AUDIO AND VIDEO ENGINEERING LAB

List Of Practicals

1. Study of different features and Measurement of directivity of various types of microphones and loudspeakers. (Approximate).
2. Frequency response of crossover networks in speaker columns.
3. Installation and operations of PA system. (Preferably in auditorium).
4. To study the operation and control of DVD player and identification of main stages and components.
5. Familiarisation with the physical layout, location of stages (transistors, ICs), major components, measurement of D.C. voltage & tracing of signal in Colour TV receiver. The student should be required to identify components from circuit diagram with physical layout of corresponding parts and marks hazardous areas.
6. Familiarisation with all controls and effects of adjustments of controls on the performance of a Colour TV receiver.
7. Fault finding in each stage of a TV receiver.
8. To study the installation process of DTH system.

NOTE:-

1. A demonstration model of a Colour TV receiver should be developed in the lab itself to perform the above related experiments.
2. Visit to the nearest TV studio and transmitter is necessary for idea of digital video communication.

5.5 OPTICAL FIBRE ENGINEERING

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TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Fundamental of Optics	12	-	-
	A. Nature of Light			
	B. Introdution To Optical Fibre			
2.	Optical Devices	35	-	-
	A. Optical Sources			
	B. Detectors			
	C. Connectors, Splicers and Splitters			
	D. Couplers and Cable			
3.	Optical Measurement	25	-	-
4.	Optical Communication	12	-	-
-		84	-	84

DETAILED CONTENTS

1. FUNCAMENTAL OF OPTICS :
 1. Nature of Light :
 - 1.1 Electromagnetic nature of light.
 - 1.2 Principle of reflection, refractions, polarization.
 - 1.3 Basic principle of optical communicaiton.
 - 1.4 Optical Network and Its Protection.
 2. Introdution To Optical Fibre :
 - 2.1 Classificaiton of fibre
 - 2.2 Physical structure.
 - 2.3 Electromagnecic mode theory for optical propagation -
Electromegnetic waves, Modes in planar guide, Modes in
cylindrical fiber phase and group velocity.
2. OPTICAL DEVICE :
 1. Optical Sources :
 - 1.1 Direct and indirect band gap semiconductors.
 - 1.2 Internal and external quantum efficiency.

- 1.3 Principle, characteristics and construction of LED.
- 1.4 Semiconductor Lasers - Laser action, PN junction laser, Fabry- Perot resonators.

2. Detectors :
 - 2.1 Introduction
 - 2.2 Photodiode- Material and types.
 - 2.3 Avalanche Photo Diode (APD), PIN diode.
 - 2.4 Temperature effect on avalanche gain, noise in APD.
 - 2.5 Photo transistor, PIN-FET, Photo darlington.
 - 2.6 Response time, BW, Noise equivalent power, responsivity.
 - 2.7 Spectral response, dark current and quantum efficiency.

3. connectors, Splicers and Splitters :
 - 3.1 Need of connectors.
 - 3.2 Types of connectors.
 - 3.3 Single and multimode fiber connectors.
 - 3.4 Need and splicing.
 - 3.5 Types of splicing. Optical Fibre Budget.
 - 3.6 Different splicing techniques.
 - 3.7 Splitters.

4. Couplers and Cable
 - 4.1 Need and types of couplers.
 - 4.2 Source of fiber couplers, Fiber to Fiber couplers, Fiber to detector couplers.
 - 4.3 Intrinsic and Extrinsic coupling loss.
 - 4.4 Reasons and types - Under ground, Under sea and over head.
 - 4.5 Elements of cable structure and its characteristics.
 - 4.6 Cable installation and design consideration.
 - 4.7 Cable jacketing, cable laying, Transport and handling.

3. OPTICAL MEASUREMENT :
 - 3.1 Introduction.
 - 3.2 Transmission loss measurements - Fiber attenuation, Fiber absorption loss measurement, Fiber scattering loss measurement.
 - 3.3 Fiber dispersion measurements - Time Domain and Frequency Domain measurements.
 - 3.4 Cutoff wave length, Fiber numerical aperture measurements.
 - 3.5 Optical Power Budget.

4. OPTICAL COMMUNICATION :
 - 4.1 Introduction of light wave.
 - 4.2 Types of modulation, ON-OFF modulation
 - 4.3 Analog and Digital transmission.

- 4.4 Audio Video and Data transmission.
- 4.5 Computer communication using RS 232 Port.
- 4.6 Coherent System.

LIST OF BOOKS

1. Optical Communicaiton - J. Paulis
2. Fiber Optics & Optoelectronics - Peter K Cheo
3. Optical Communion- Senior J. M.
4. Fiber Optics in Telecommunicaiton - N. Sharma
5. An Introduction to Optical Fiber - Allen H Cherin.
6. Understanding Fiber Optics - Jeff Hecht.

OPTICAL FIBRE ENGINEERING

List Of Practicals

1. Study of reflection of light.
2. Study of LED characteristics.
3. Study o Laser characteristics
4. Study of Optical detector characteristics
5. Study of diferent connectors.
6. Study of different splicers.
7. Study of different couplers and splitters.
8. Measurement of connectors loss.
9. Measurement of splice loss.
10. Measurement of coupling loss.
11. Study of dispersion loss in Fiber.

VI SEMESTER

6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

L	T	P
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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 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.

6.3 MODERN COMMUNICATION SYSTEMS

L T P
8 - 6

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction To communication System	5	-	-
2.	Telegraphy & Telephony	8	-	-
3.	Digital Switching Systems	18	-	-
4.	Digital Communication	20	-	-
5.	Setellite Communication	18	-	-
6.	Mobile Communication	18	-	-
7.	Data Communication	23	-	-
-	-	112	-	84

DETAILED CONTENTS

1. INTRODUCTION TO COMMUNICATION SYSTEM :

Basic idea of telegraphy, telephonic, digital, microwave, fibre optics, sttellite, mobile and data communication.

Features of Microwave communication system, Block diagram, Antenna types.

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. DIGITAL COMMUNICATION:

4.1 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.

4.2 Sampling Theory and Pulse Modulation : Sampling theorem, Signal reconstruction in time domain. Types of analog pulse modulation, Method of generation and detection of PWM, PNM and PPM.

4.3 Waveform Coding Technique : Quantization, Quantization noise, Encoding and Pulse code modulation, Differential pulse code modulation, Delta modulation, Comparison of PCM and DM.

4.4 Digital Multiplexing : Fundamentals of time division multiplexing electronic commutator.

4.5 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 comparison of various digital modulation techniques.

4.6 Error Control Coding : Error free communication over a noisy channel, Hamming sphere, Hamming distance and Hamming bound, Relation between minimum distance and error detecting and correcting capability.

5. SATELLITE COMMUNICATION:

(i) Introduction, historical background and basic Concepts of satellite communication. Elements of satellite communication link.

- (ii) Geostationary orbits, Orbit mechanisms and launching of satellite
- (iii) Satellite space craft- Satellite sub system, Tracking and Command, Communication subsystem, Transponders, Space Craft antenna
- (iv) Satellite Channel and Link Design : Design 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

6. 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

7. 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.
7. 3G Technology, YMax Technology, LTE, FTTL, Antenna used in mobile communication, Mobile Handset, IME number, SIM, IPB-4 and IPB-6, Router, Switch, LAN, WAN

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 Swithcing 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. Tanebaum Abdrew S. - Computer Networks - Prentic 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 cellular 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 WIRELESS AND MOBILE COMMUNICATION

L T P
5 1

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Wireless Communication	20	6	-
2.	Mobile Communicaiton	15	6	-
3.	Multiple Access Technique	15	6	-
4.	Cellular Concept	10	5	-
5.	Mobile Communication System	10	5	-
-		70	28	-

DETAILED CONTENTS

1. WIRELESS COMMUNICATION :

Introduction to Basics of wireless communication, Advantages of Wireless Communications, Wlectromagnetic Waves, Frequency Spectrum used in wireless communication, Propagation consideration about Range, Atmospheric Effect, Geographic Effect, Fading, Doppler Effect. Introduction to Wireless Metropotitan Area Network (WMANs), Wireless Local Area Networks (WLANs), Wireless Personal Area Network (WPANs).

2. MOBILE COMMUNICATION :

Evolution of Mobile Radio Communication, Mobile Radio System around the World, Example of Wireless Communication System like Cordless Telephone System, Cellular Telephone System.

3. MULTIPLE ASSESS TECHNIQUES FOR WIRELESS COMMUNICATION :

Spread spectrum modulation techniques - Pseudo-noise sequence, Direct sequence spread spectrum (DS-SS), Frequency hopped spread spectrum (FH-SS). Introduction to Multiple Access, Frequency Division Multiopple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMa), Spread Spectrum Multiple Access (SSMA), Channel Loading, Channel Allocation Schemes.

4. CELLULAR CONCEPT:

Introduction about Cell area, Hexagonal Cell, Capacity of cell, Frequency response, Frequency reuse, Co-channel Interference, Adjacent channel interference, Power control for reducing interference. Channel assignment strategies, Handoff strategies, Dropped call, Call splitting, Types of handoff, Handoff invitation, Delaying handoff, Force handoff, Mobile assigned handoff, Vehical location method, Improving coverage and capacity in cellular system- Cell splitting, Sectoring, Repeater for Range extension.

5. MOBILE COMMUNICATION SYSTEM :

Introduction of Advance Mobile Phone Systems (AMPS), Operation of AMPS, Working of AMPS Phone System, Global System for Mobile Communication (GSM), GPRS, GPS, Elable positioning systems, Wimax

RECOMMENDED BOOKS

1. Introduction to Wireless and Mobile Systems, Second Edition , Dharma Prakash Agrawal and Qing-An-Zeng, Thomson India Edition
2. Wireless Communication (Principles and Practice), by Theodore S Rappaport.
3. Wireless Communicaitons and Networking by William Stallings.
4. Mobile and Personal Communication Systems and Services by Raj Pandya, Prentice Hall of India, New Delhi
5. Modern Wireless Communication, Simon Haykin and Michael Moher, Pearson Education, Low Price Edition.

6.5 PROJECT

L	T	P
0	0	8

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 make simple circuit which will demonstrate the use of tranistor as a switch. (The student should measure I_c and V_{ce} in this circuit when I_b is varied from zero to a maximum value and measures the value of I_b (sat), I_c (sat), V_{ce} (sat) and H_{fe} (min) for saturation at a given supply voltage and load.
2. To calculate the values and assemble and test simple transistor switching circuit to switch on a
 - (a) LED.
 - (b) Relay.
 - (c) 200/500 ma. lamp. (6v/12v).
3. Make a battery eliminator
4. Make a battery charger.

5. Fabricate (including making PCB) and testing of regulated power supply (series and shunt circuit using zener diode and IC type).
6. Assembly and testing of a two band transistor radio receiver.
7. Fabrication and testing of any ICs of consumer interest, For example.
 - (a) Fan regulator/Light dimmer.
 - (b) Timer using IC 555.
 - (c) Burglar's alarm.
 - (d) Digital clock.

The list is only suggestive, more items may be included

LIST OF PROJECTS

NOTE: The list of projects shown below is to be used as a guideline by the BTE(UP) for drawing up the project list for the diploma examination. Expert team formulating the final list may consult this list to ensure that the complexity level is consistent with the guideline set here.

1. AMPLIFIERS:

- 1.1 Simple transistor / FET / IC amplifier to meet the given specifications.
- 1.2 Audio frequency mono/stereo amplifier including usual control facilities (including power amplifier and power supply stages).

2. OSCILLATORS:

- 2.1 Sine wave oscillators of given specifications using transistors/FETs/ICs (tuned oscillators, phase shift, including Wein's Bridge oscillators).
- 2.2 Multivibrators of different types to produce square wave output signals of given specifications (Monostable, Bistable and Astable) using transistor FET or IC circuits.
- 2.3 Simple function generators.

3. POWER SUPPLIES:
 - 3.1 Single dual and multiranged low voltage and low power fixed variable D.C. power supplies of different specifications using transistor and regulator ICs.
4. TIMERS AND OPERATIONAL AMPLIFIERS:
 - 4.1 Timers of different types using 555/556 ICs.
 - 4.2 Amplifiers, oscillators, active filters, differentiations, integrator, scale changer and other simple circuits using operational modules.
5. DIGITAL CIRCUITS:
 - 5.1 Simple three digit counter.
 - 5.2 24 hour and 12 hour digital clock.
 - 5.3 Electronic multimeter.
 - 5.4 A/D and D/A convertors.
 - 5.5 Interface circuits using Microprocessors.
6. MISCELLANEOUS CIRCUITS:
 - 6.1 Fan regulators, motor speed control, phase controlled rectifier and similar circuits using Thyristor/Triac/Diac/UJT and similar PNP devices.
7. RADIO RECEIVER:
 - 7.1 Simple one or two band AM radio receiver.
 - 7.2 Simple transreceiver.
8. Mobile Phone based devices and Microcontroller based devices.

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. The board may request all heads of Electronics Engineering Departments of U.P. Polytechnics to provide list of projects. An expert committee may be appointed to screen the

project list.

3. The BTE (UP) may adopt the following format for the project report.

FORMAT

A project report (of about 100 typed computer pages) should submitted covering the following points.

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

NOTE:

For specialisation Digital Electronics and Microprocessors and Radio, Audio Video Engineering, Mobile Communication more project in these subjects should be given by the teachers.

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING
STAFF STRUCTURE

Intake of the Course 60
Pattern of the Course Semester Pattern

Sl. No.	Name of Post	No.
1.	Principal	1
2.	H.O.D.	1
3.	Lecturer Electronics	5
4.	Lecturer in Maths	1--
5.	Lecturer in Chemistry	1 Parttime or common
6.	Lecturer in Physics	1 with other discipline
7.	Lecturer in Comm. Tech.	1 if the intake is
8.	Lecturer in Elect. Engg.	1 more than 180 --
9.	Computer Programmer	1
10.	Steno Typist	1
11.	Accountant / Cashier	1
12.	Student / Library Clerk	1
13.	Store Keeper	1
14.	Class IV	6
15.	Sweeper	Part time as per requirement
16.	Chaukidar & Mali	as per justification

Note :

1. Services of other discipline staff of the Institute may be utilized if possible
2. Qualifications of Staff : as per service rule
3. The post of "Computer Programmer" is not needed in the institutions where diploma in "Electronics & Communication Engineering" is running.

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
4.	Electrical Engg. Lab/Shop		120
5.	Electronics Lab/Shop		120
6.	Radio & TV Engineering Lab		120
7.	Digital Electronics & Microprocessor Lab		120
8.	Electronics Workshop & Project Lab		120
9.	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 0-110°C (Least count 0.1°C desirable)	4	100	400
9.	Potentiometer - 10 wires (1 meter length of each wire) with jockey, sunmoical top	4	750	3000
10.	Moving coil galvanometer 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

ELECTRONIC WORKSHOP

PART (A) - ELECTRICAL WORKSHOP

S.No.	Name of Equipment /Board/Kit etc.	Equipment required		Rate per Piece @ Rs.	Total cost	
		Intake 60	75		Intake 60	75
1.	Coil winding Machine.	4	5	5000	20000	50000
2.	Bench Drilling Machine.	2	3	5000	10000	15000
3.	Bench Lathe.	2	3	10000	20000	30000
4.	Portable Drilling Machine.	6	7	1500	9000	10500
5.	Multimeter (indicating type and assorted)	6	7	1000	6000	7000
6.	Megger (1000 V) and Growler	1 each	1 each	--	7000	7000
7.	Bearing Pullers, Pulley Pullers, wire gauges and blow lamps	LS	LS	--	4000	6000
8.	Ceiling fans of different types (one with solid state speed control)	LS	LS	--	10000	15000
9.	Electric appliances (Iron, Hot Plate to Aster, immersion heater and room heater, air heater, water cooler)	LS	LS	--	20000	25000
10.	Old burnt out ceiling fan motor, grinder motors, D C motor armatures, and three phase induction motors for winding	LS	LS	--	15000	20000

S.No.	Name of Equipment /Board/Kit etc.	Equipment required		Rate per Piece @ Rs.	Total cost	
		Intake 60	75		Intake 60	75
11.	Starter (3 Point 40 Point D.O.L. star/delta, auto transformer and automatic star/ delta) for fault creation and rectification	LS	LS	--	15500	20500
12.	Single Phase Variac (15 A)	2	3	2500	5000	7500
13.	Dynamic demonst- ration model of automobile ele- ctrical wiring	LS	LS	--	15000	25000
14.	Spare starting motor dynamo cut out, wiper moter, ignition coil & horn for car moters	LS	LS	--	8000	12000
15.	Different types of lamps with their fittings	2 set	2 set	--	8000	8000
16.	HV support fitt- ing & insulators	LS	LS	--	3000	4500
17.	HV cable secti- ons and jointing materials	LS	LS	--	5000	8000
18.	Damonstrations boards on fuses, switches, condu- ctors and elect- rical engg. mat- erials(one each)	LS	LS	--	5000	8000
19.	Electric Blower	2	3	3500	7000	10500
20.	Low Voltage circuit breakers & conductors	LS	LS	--	8000	10000

S.No.	Name of Equipment /Board/Kit etc.	Equipment required		Rate per Piece @ Rs.	Total cost	
		Intake 60	75		Intake 60	75
21.	Wiring boards (Wodden)	LS	LS	--	10000	15000
22.	Miscellaneous tools (for ser- vicing & cable jointing, sold- ering irons, neon testers etc.)	LS	LS	--	20000	25000

ELEMENTARY WORKSHOP PRACTICE

MECHANICAL WORKSHOP

(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.	Sparry Painting Plant (Including air compressor)	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 ENGINEERING LAB

(i) Electrical Engineering-I (First Year)
(ii) Electrical Engineering-II (Second Year)

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 constantan coils, single dial 10x10, 10x100, 10x1000, 10x10,000 ohms	2	2500
8.	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.	Energymeter (Substandard)	2	10000

	single phase, induction type 5 A/10A, 250 V, 50 Hz.		
11.	Power factor meter dynamometer type, eddy current 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.	1	15000
12.	Frequency meter (Reed type) 230 V, range for having 21 reeds for 40-60 Hz range.	2	2000
13.	Rheostat sliding rheostats wound with evenly oxidised iron free nickel copper on vitreous enamelled round steel tube 150 ohms 2 Amps. 110 ohms 2.5 Amps.	2 2	1500 1500
14.	Variable inductor single phase, 250 V, 2.5 KVAR continuously variable	2	6000
15.	Battery charger 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	2	5000
16.	Capacitors 2.5 microfarad, electrolytic type	8	2000
17.	Q Meter frequency 0 - 30 MHz Q 0 to 500	2	15000
18.	LCR meter (digital) 3.5 digit display capacitance 0 to 20,000 microfarad inductance 0 to 200 Henry resistance 0 to 20 M ohms	2	20000
19.	LCR/Q bridge capable of measuring resistance, inductance and capacitance of range 8 amps, 0.012 to 10 M ohms, 4 to 10,000 H, 0.5 pico farad to 10 F.	2	20000
20.	Kelvin double bridge 10 x 0.1 ohms circular slide wire divided into 200 equal parts	2	15000
21.	Energy meter 3 phase induction type, 4 wire, industrial grade, 50 Hz, 10 A, 440 Volt	2	15000
22.	Energy meter (Sub standard) 3 phase, 4 wire, 440 V, 10A, 50 Hz induction type.	2	15000

23.	Transformer single phase core type, 230/110 V, 1 KVA, 50 Hz.	2	12000
24.	Universal shunt 0 - 75 A	2	5000
25.	Current transformer 10/25/50/5A as per IS 4201/1967 and 2705/1981	2	6000
26.	Potential transformer 10 VA, 415/110 V as per IS 4201/1967 and 2705/1981	2	6000
27.	Strain guage	2	3000
28.	Maxwells bridge	2	4000
29.	Laboratory D.C. power supply (220 V) static converter input from 3 phase 50 Hz, 415 volts A.C., output rating of 200 watts to 260 watts, 50 amps, continuously varibale.	2	150,000
30.	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.	1	375000
31.	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.	2	50000
32.	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.	2	30,000
33.	3 Phase variable inductive loading unit rating 400 V, 50 Hz, 0-10 Amps.	2	25000
34.	3 Phase variable capacitive loading unit: rating 400V, 50 Hz, 0-10 Amps.	2	18000
35.	3 Phase squirrel cage induction	2	50000

	motor rating 415 V, 50 Hz, 1440 rpm 3 KW with star/Delta starter		
36.	Starters for squirrel cage induction motor suitable for 3KW, 415V, 50 HZ, 1440 rpm		
	a. Star/delta automatic	2	1500
	b. Star/delta manual	2	1000
37.	Starter for squirrel cage induction motor 3KW, 415 V, 50 Hz, 1440 rpm direct on line	2	10000
38.	Static speed control unit for 3 phase induction motor 3 KW, 425, 0-1500 rpm.	2	20000
39.	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.	2	50000
40.	Capacitor start single phase induction motor 230 V, 50 Hz 1440 rpm, 500 watts.	2	8000
41.	Watt meter 3 phase induction type 2 element voltage range 0/300/600 V current range 0/5/10 A	2	10000
42.	Frequency meter - portable (Reed type) 45-55 Hz with 21 reeds Frequency meter digital portable 3.5 digit LED display range 20-99 Hz	2	8000
43.	Phase sequence indicator (Rotary) 3 phase, 415 V, 50 Hz	2	4000
44.	Phase sequence indicator (Indicating type) 3 phase, 400 V, 50 Hz	2	5000
45.	Galvanometer centre zero response time 1.8 sec.	2	4000
46.	VAR meter 1/5 A, 300/600 V	2	6000
47.	Synchroscope - portable 230 V, 50 Hz	2	10000
48.	Loading rheostat single phase		
	a. 240 V, 2.5 KW, trolley type resistance type	2	10000
	b. 240 V, 6 KW insteps of 0.25	2	10000
49.	Lamp load 3 phase 415 V, 6 KW	2	7000
50.	Water load 3 phase 415 V, 5 KW	2	7000

51.	Capacitor bank 415 V, 0-10 A, 50 Hz trolley mounted	2	10000
52.	Wire wound rheostats		
	15 ohms, 10 A	4	4000
	100 ohms, 5 A	4	4000
	250 ohms, 5 A	4	4000
	1000 ohms, 0.5 A	4	4000
	2500 ohms, 0.1 A	4	4000
53.	Stop watch least count 0.01 Sec.	4	6000
54.	Stop watch (digital) LED	4	6000

OPTICAL FIBER ENGINEERING LAB

S.No.	Name of Equipment /Board/Kit etc.	Equipment required		Rate per Piece @ Rs.	Total cost	
		Intake 60	75		Intake 60	75
1.	Fiber Striper	4	6	2500	1000	15000
2.	Fiber Claverr	4	6	10000	40000	60000
3.	Fiber Cable Cutter	4	6	2500	1000	15000
4.	Demonstrating Board of Diff. Fiber Cables	2	3	2500	5000	7500
5.	Splicing Machine Standard Make	1	2	400000	400000	800000
6.	Optical Power Meter -10db to +20db	4	6	1000	4000	6000
7.	Optical Patch Card 10m,20m, FCPC-FCPC	LS	LS	--	8000	10000
8.	Pad 5db, 10db 20db, etc.	LS	LS	--	10000	15000
9.	Optical Power Source Meter	2	3	1500	3000	4500
10.	Optical Talk Set	3	4	30000	90000	120000
11.	Servo Voltage Stablizer 5KV!	1	1	75000	75000	75000

NOTE : Any required other than above equipment will be shared with other lab.

ELECTRONICS LABORATORY

Electronic Components And Devices Lab.
Industrial Electronics And Transducers Lab.
Networks Filters & Transmission Lines Lab.
Electronic Devices & Circuits Lab.

S.No.	Name of the Equipment/ Board/Kit Etc.	Elex. Components Lab.		Indus. Transducers Lab.		Networks Filters & Transmission Lab.		Elex. Devices & Ckts. Lab.		Total		Total No. Recommended		Rate per Piece In Rs.	Total Cost	
		60	75	60	75	60	75	60	75	60	75	60	75		60	75
		Intake		Intake		Intake		Intake		Intake		Intake		Intake		Intake
1.	Audio Oscillator (20HZ-50KHZ)	4	5	-	-	14	15	12	13	30	34	26	28	3500	91000	98000
2.	Multimeter, 20 K. Ohm per volt Sensitivity, + 1% accuracy d.c. voltage 1000 v. max.	4	5	-	-	8	10	-	-	12	15	10	12	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	4	5	14	16	16	17	48	54	24	27	4500	108000	121500
4.	Regulated Power Supply 0-30 V, 0.5/1 Amps.	10	12	4	5	-	-	16	17	30	34	20	22	4000	80000	88000
5.	Multi output Power Supply 0-30V 1 Amp. 0+/-12 V, 1 Amp., 5 V. 2 Amp.	4	5	-	-	-	-	4	5	8	10	6	7	3500	21000	24500
6.	Power Supply 0-300 Volt, 1 Amp.	-	-	4	5	-	-	-	-	4	5	4	5	4000	16000	20000
7.	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	10	10	-	-	10	11	24	27	16	18	30000	480000	540000
8.	R.F.Signal Generator (AM/FM) 500 KHZ to 1.3 GHZ Standard Mak	-	-	-	-	-	-	4	5	4	5	4	5	10000	40000	50000
9.	Function Generator upto 10MHZ, Amplitude 0-20V PP LED Display, Frequency Variation Fine Control Output Protected against short circuit, Input 230V AC +10 50HZ	-	-	-	-	-	-	6	7	6	7	6	7	10000	60000	70000
10.	A.C. Millivolt Meter/Micro Meter (Elex.)	-	-	-	-	-	-	8	9	8	9	8	9	3500	28000	28500
11.	Out Put Audio Power Meter 4 Ohm.- 20 K & 1 MW - 10 W	-	-	-	-	-	-	2	3	2	3	2	3	1500	3000	4500
12.	Digital MultiMeter/Micro Meter Digital Millivoltmeter (Suitable range)	4	9	4	5	-	-	-	-	12	14	8	9	600	4800	5400
13.	D.C. Voltmeter /D.C. Milliammeter/D.C. Micrometer (suitable range)	30	40	-	-	-	-	10	12	40	52	30	35	600	18000	21000
14.	Decade Resistance Box (Different ranges) Min 4/5/6 Dials Max Working Voltag 500V	-	-	-	-	6	7	-	-	6	7	6	7	1200	7200	8400
15.	Decade Capacitor Box (Different range) Min 4/5/6 Dial Cont	-	-	-	-	8	9	-	-	8	9	8	9	3000	24000	27000
16.	Decade Inductance Box Min 4/5 Dials	-	-	-	-	8	9	-	-	8	9	8	9	3500	28000	31500
17.	Different Transducers : pressure type, thermo couple, LVFT, Opto pick electromagnetic pick up; Thermal relay, ultrasonic pick up and potentiometer etc. including strain gauge, Piezoelectric Transduser, Diff. types of Photo sources & Detector, Optical Fibre sensors	-	-	8	8	-	-	-	-	8	8	LS	LS	8000	64000	64000

18.	Experimental Kit/ Teaching Modules/ Training boards/ Learning kits. of relevant subject.	2* +	3* +	0 +	0 +	2* +	3* +	0 +	0 +	4* +	6* +	LS	LS	50000	100000	100000	
19.	Component Storage rack	4	4	4	4	4	4	4	4	16	16	16	16	8000	128000	128000	
20.	Consumable Items	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	30000	30000	
21.	Miscellaneous	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	50000	50000	
22.	Power Operated Drilling Machine	2	3	2	3	2	3	2	3	2	3	2	3	3500	7000	10500	
23.	Servo Voltage Stablizer 5 KVA	1	2	1	2	1	2	1	2	1	2	1	2	75000	75000	150000	
S.No.	Name of the Equipment/ Board/Kit Etc.	Elex. Components & Devices Lab.		Indus. Elex. & Transdu- cers Lab		Networks Elex. & Filters Lab.		Elex. Devices & Ckts.Lab.		Total		Total No. Recommen- ded		Rate per Piece		Total Cost	
		Intake		Intake		Intake		Intake		Intake		Intake		In Rs.		Intake	
		60	75	60	75	60	75	60	75	60	75	60	75			60	75
24.	Invertor 1 KVA with Battery	1	2	1	2	1	2	1	2	1	2	1	2	15000	15000	30000	
25.	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	2	3	2	3	2	3	2	3	2	3	40000	80000	120000	
26.	Electronics Software For Electronics Lab Virtual Lab/ Circuit Maker etc. of Latest Version	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	300000	300000	

NOTE:- * Represents the quantity of learning kits/teaching module. This item is more costly as compared to training boards/experimental kits etc.

RADIO & AUDIO VIDEO ENGINEERING LAB

Principles of Communication Engineering Lab. (Second Year)
Audio & Video Engineering Lab (Third Year)

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of comm. Engg. Lab.		Audio & Video Enginee- ring Lab		Total		Total No. Recommen- ded		Rate per Piece In Rs.	Total Cost	
		Intake		Intake		Intake		Intake			Intake	
		60	75	60	75	60	75	60	75	60	75	
1.	Audio signal generator 20 Hz -50 KHz, 15 V. p.p, 60 db step attenuator	6	7	10	13	16	20	12	16	4500	54000	72000
2.	High quality stereo amplifier, 60 W per channel less than 1% distortion with bass treble & balance controls or Higher range	-	-	4	5	4	5	4	5	3500	14000	17500
3.	Digital A.C. voltmeter True RMS type with lowest full scale range 200 MV & accuracy 1%	4	5	8	10	12	15	12	14	3500	42000	49000
4.	Distortion Factor Meter:Minimum full scale 1% max. output meas- urable 50 W	2	3	2	3	4	6	4	5	10000	40000	50000
5.	High Quality 20 W speaker set (woofer squeeaker & tweeter) in cabinet	-	-	8	12	8	12	8	12	1000	8000	12000
6.	Speaker set (one set consists of one woofer one squeeaker & one tweeter)	-	-	4	6	4	6	4	6	1000	4000	6000
7.	Commercial Quality DVD Player	-	-	2	4	2	4	2	2	3500	7000	7000
8.	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	2	3	4	6	4	6	3500	14000	21000
9.	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	2	3	4	6	4	6	3500	14000	21000

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of comm. Engg. Lab.		Audio & Video Enginee- ring Lab		Total		Total No. Recommen- ded		Rate per Piece In Rs.	Total Cost	
		Intake		Intake		Intake		Intake			Intake	
		60	75	60	75	60	75	60	75	60	75	
10.	Table Type Digital Multimeters 3 & 1/2/4.5 digit 0.3% accuracy 1000 V DC & 20 M Ohm ranges Protected against transients battery cum mains operation	2	2	2	3	4	6	4	6	6000	24000	30000
11.	Speaker Column (8" speakers)	-	-	4	4	4	4	4	4	1000	4000	4000
12.	Dual Trace Oscilloscope 100MHZ, 4kpts of memory, 2 channels with additional external trigger input, large 15 cm colour dispaly,Advanced Triggering including edge pw and line selectable video USB interface for PC Connectivity	2	3	2	3	4	6	4	6	3500	14000	21000
13.	Dual Trace Oscilloscope 25 MHz 60 MHz,5 MV sensitivity	2	3	-	-	2	3	2	3	20000	40000	60000
14.	Full HD, 3D TV-Size 55 inch (140 cm.) LED/LCD with remote control, Wi-Fi connectivity, USB 2.0 Attachment HDMI Supported atleast two ports 3D Googles-02 No.	-	-	2	3	2	3	1	2	200000	200000	400000
15.	Full HD LED/LCD 32 inch(81 cm.) 16:9, USB 2.0 ready HDMI Ready Two Ports, Remodte Control Wi-Fi Connectivity	-	-	4	4	4	4	4	4	50000	200000	200000
16.	Professional Quality Pattern	-	-	2	2	2	2	2	2	40000	80000	80000

	Generator with colour & B & W pattern with sensitivity control and 6 channel VHF/UHF electronics tuner											
17.	Servicing Quality Pattern Generator with VHF output and colour/B & W patterns	-	-	2	2	2	2	2	2	5000	10000	10000
18.	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	-	-	4	5	4	5	18000	72000	90000

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of comm. Engg. Lab.		Audio & Video Engineering Lab		Total		Total No. Recommended		Rate per Piece In Rs.	Total Cost	
		Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75		Intake 60	Intake 75
19.	Regulated power supply 0-30 v, 0-1 Amp. 0.1% regulation short circuit and overload protected	2	3	4	5	6	8	6	8	3500	21000	28000
20.	R.F Signal generator (AM), 30 MHz, 10 MHz, External Mod. variable modulation	10	14	-	-	10	14	10	14	3000	30000	42000
21.	Transistor Radio Receiver 2 band portable, battery cum mains	4	5	-	-	4	5	4	5	800	3200	4000
22.	Transistor Radio Table Model battery cum mains	4	5	-	-	4	5	4	5	1500	6000	7500
23.	Antenna simulator	4	5	-	-	4	5	4	5	1000	4000	5000
24.	TV Antenna, 3 element and yagi (1 each) Set	-	-	2	2	2	2	2	2	800	1600	1600
25.	Radio Antenna Directional and Omnidirectional	2	2	-	-	2	2	2	2	500	1000	1000
26.	Dish Antenna Connection DTH/- other along with associated connectors and cables	-	-	2	3	2	3	2	3	4500	9000	9000
27.	RF Signal Distribution equipment alongwith associated connectors and cables	-	-	2	2	2	2	2	2	25000	50000	50000
28.	Sweep Generator	-	-	2	2	2	2	2	2	25000	50000	50000
29.	Wobblescope	-	-	2	2	2	2	2	2	50000	100000	100000
30.	Digital Handicam	-	-	2	2	2	2	2	2	20000	40000	40000
31.	DVD Writer and Player	-	-	2	2	2	2	2	2	10000	20000	20000
32.	Diff. Types of Antenna-MF, HF VHF, UHF & Microwave	-	-	LS	-	-	-	-	-	LS	25000	
33.	Experimental Kits demonstrating ASK, FSK, FSK	-	-	LS	-	-	-	-	-	LS	100000	
34.	Diff. Types of Microphones	-	-	LS	-	-	-	-	-	LS	20000	
35.	Commerical P A System 16 W-220V, Output AC & 24V DC operated, 5 Mic & 2 Auxilary input, Speaker output 4 Ohm 8 Ohm & 17 V & 100 V	-	-	2	2	2	2	2	2	20000	40000	40000

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of comm. Engg. Lab.		Audio & Video Engineering Lab		Total		Total No. Recommended		Rate per Piece In Rs.	Total Cost	
		Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75		Intake 60	Intake 75
36.	Home Theater Support Disc type CD,CDR/CDRW DVDR/DVDRW, VCD Supported with USB Port Support & 5.1 Channel Format Support-DIVX/JPEG/MP3	-	-	-	-	-	-	4	6	25000	100000	150000

* - These items may preferably be purchased in the form of board mounted training modules instead of commercial sets.

DIGITAL ELECTRONICS AND MICROPROCESSOR LAB

Principles of Digital Electronics Lab. (Second Year)
 Modern Communication System Lab. (Third Year)
 Microprocessors And Applications Lab. (Third Year)

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of Digital Eltx. Lab.		Telecom- municat- ion Lab.		Micropro- cessors & Applicat- ion Lab.		Total		Total No. Recommen- ded		Rate per Piece		Total Cost	
		Intake		Intake		Intake		Intake		Intake		@ Rs.	Intake		
		60	75	60	75	60	75	60	75	60	75		60	75	
1.	CRO dual trace with delayed time base, 25 MHz or higher band width.	2	2	2	2	-	-	4	4	4	4	25000	100000	100000	
2.	CRO dual trace 100MHz. Digital storage oscilloscope 4 Kpts of Memory, 2 Channels with additional external trigger input, Large 15 Cm. colour display, 20 automatic measurement & 4 math function advance triggering selectable video, mask test,USB inter face for PC Connectivity	2	3	-	-	-	-	2	3	2	3	30000	60000	90000	
3.	CRO dual trace 30 MHz. Accuracy +3%, Variable Cont. For Stable triggering, Slope Positive or Negative Trace Rotation adjustable on front panel, CRT 140 mm Z Modulation	4	4	2	3	2	3	8	10	6	7	15000	90000	105000	
4.	Multimeter, 20 K Ohm/volt sensitivity, 1% accuracy in D.C. voltage range, Max. D.C. voltage range 2500 V, A.C Curr-ent.	4	6	2	4	-	-	6	10	6	8	3500	21000	28000	
5.	Multimeter,Digital hand held 3.5/4.5digit, 0.3% accuracy 1000 V D.C. and 20 m ohm res-istance range protected against transients.	4	6	2	4	2	4	8	14	8	10	3500	28000	35000	
6.	Logic Probe	30	35	-	-	10	15	40	50	40	50	500	20000	25000	
7.	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	
8.	Microprocessor trainer kits with 8085 system (EC 85 or similar).	-	-	-	-	16	20	16	20	16	20	12000	192000	240000	

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of Digital Eltx. Lab.		Telecom- municat- ion Lab.		Micropro- cessors & Applicat- ion Lab.		Total		Total No. Recommen- ded		Rate per Piece		Total Cost	
		Intake		Intake		Intake		Intake		Intake		@ Rs.	Intake		
		60	75	60	75	60	75	60	75	60	75		60	75	
9.	Component rack 144 tray (small) & 24 large tray.	4	4	-	-	2	2	6	6	6	6	8000	48000	48000	
10.	Consumable material such as components ICs, resistors transistors etc.	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	80000		
11.	Miscellaneous	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	100000		
12.	Micro Controller Kits/PLC	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	50000		
13.	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		
14.	Dual power supply (0-30v/.5amp)	-	-	4	6	-	-	4	6	4	6	5000	20000	30000	
15.	Minimum 12 line electronic telephone exchange with teleph-one instrument sets and power supply (Cardless)	-	-	2	2	-	-	2	2	2	2	50000	100000	100000	
16.	Mobile Phone-GSM 3G/HSDPA Supported with Wi-Fi, Bluetooth Connectivity,Android 2.3 Operating System Supported with Colour Display TFT Screen with SD Memory Card, Battery 1300 mAH or Higher	-	-	8	8	-	-	8	8	8	8	15000	120000	120000	
17.	Tablet PC-Min 7 inch Capactive	-	-	8	8	-	-	8	8	8	8	1000	8000	8000	

	Touch Screen,Android 4.0 or Upper Operating System,2D/3D Graphic Processor, 4GB internal Memory Expendable upto 40GB with Front Camera , Battery 2800 mAH or Higher													
18.	Experimental Kits for demonstrating ASK, FSK, PSK circuits	-	-	2	2	-	-	2	2	2	2	80000	160000	160000
19.	Experimental Kits for Optical Fibre Communication	-	-	LS		-	-	LS				LS	100000	
20.	Mobiles Phones Trainer Kit with Fault Finding Facilities, Various Test Point Faculties	-	-	4	4	-	-	4	4	2	2	25000	50000	50000
S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of Digital Eltx. Lab.		Telecom-unicat-ion Lab.		Micropro-cessors & Applicat-ion Lab.		Total		Total No. of Recommen-ded		Rate per Piece	Total Cost	
		Intake		Intake		Intake		Intake		Intake		@ Rs.	Intake	
		60	75	60	75	60	75	60	75	60	75		60	75
21.	Computers System Dual Core i5/i7 with internet connection and UPS	-	-	2	2	-	-	2	2	2	2	50000	100000	100000
22.	Microprocessor Training Kit of 8086	-	-			12	15					LS	100000	
23.	Fax Machine (Multi Function)	-	-	2	3	-	-	2	3	2	3	10000	20000	30000
24.	Universal Data Book	1	1	-	-	1	1	1	1	1	1	5000	5000	5000
25.	Software	-	-	-	-	-	-	-	-	-	-	LS	200000	

ELECTRONICS WORKSHOP AND PROJECT LABORATORY

Electronics Workshop (First Year & Second Year)
 Electronics Instruments and Measurements Lab. (Third Year)
 Project (Third Year)

S.No.	Name of the Equipment/ Board/Kit Etc.	Electronics Workshop		Electronics Inst. & Measurements Lab		Project		Total		Total No. Recommended		Rate per Piece		Total Cost	
		Shop		Inst. & Measurements Lab		Project		Total		Total No. Recommended		In Rs.		Total Cost	
		Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75	Intake 60	Intake 75	In Rs.	Intake 60	Intake 75	Intake 60
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	4	6	12	18	8	10	2500	20000	25000	
3.	Digital Multimeter	4	6	6	8	4	6	14	20	10	12	3500	35000	42000	
4.	Regulated Power Supply Variable 0-30 V; 1 A	2	2	4	6	8	10	14	18	8	10	3000	24000	30000	
5.	Transistor power supply (+,-,Comm)0-30 V / 1 A variable	2	2	2	3	8	10	12	15	8	10	3500	28000	35000	
6.	Unregulated power supply 0-30 V; 1 A	2	2	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	4	6	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	4	6	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	2	3	2	3	2	3	6	9	4	6	25000	100000	150000	
	micro controller, Main supply 200V +10%, 50 Hz output voltage max 10V into 50W, attenuation two step variable														
10.	Std. Signal Generator	4	6	2	2	2	3	8	11	4	6	15000	60000	90000	
11.	AC/DC Voltmeter (M.I.type)	-	-	4	6	-	-	4	6	4	6	600	2400	3600	
12.	CRO 200 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.	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	

14.	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	
15.	RLC/Universal Bridge AC/DC Bridge	-	-	2	3	2	3	2	4	4	5	8000	32000	40000	
16.	Universal Digital Freq. Counter	-	-	2	3	2	3	4	6	2	3	20000	40000	60000	
17.	Distortion Factor Meter	-	-	2	2	-	-	2	2	2	2	12000	24000	24000	
18.	Decade Resistance Box 4/5/6 Dials	-	-	2	3	2	3	4	6	4	6	1500	6000	9000	
19.	Decade Cap. Box 4/5/6 Dials	-	-	1	2	1	2	2	4	2	3	3000	6000	9500	
S.No.	Name of the Equipment/ Board/Kit Etc.	Electron-ics Work-Shop		Electro-nics Inst. & Measurem ents Lab		Project		Total		Total No. Recommen- Piece ded		Rate per Piece		Total Cost	
		Intake		Intake		Intake		Intake		Intake		In Rs.		Intake	
		60	75	60	75	60	75	60	75	60	75		60	75	
20.	Std. Inductance (Diff. Value)	-	-	4	6	-	-	4	6	4	6	600	2400	3600	
21.	Charts, Models, displays for safety/rules etc.	LS	LS	-	-	-	-	LS	LS	LS	LS	--	10000	10000	
22.	Digital Multimeter 4.5 Digit Display, AC/DC Voltage, AC/DC Current 20A Resistance, Capacitors Frequency Diode Test, Transistor Test & Continuity Test	2	3	6	6	4	6	12	15	6	8	5000	30000	40000	
23.	Single Phase Variac 5 Amp, 15 Amp (Oil/Air cool)	4	10	2	4	8	10	18	22	10	12	5000 av.	50000	60000	
24.	Calibrated Dual Trace CRO 100 Mhz Digital Storage oscilloscope-upto 1GSa/s Simple Rate Memory 4 Kpts or Higher, 2 Chennel 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	2	3	-	-	6	6	6	8	4	6	30000	120000	180000	
25.	Tools Kit	20 SET	30 SET	-	-	20 SET	30 SET	40 SET	60 SET	30 SET	40 SET	1500	45000	60000	
26.	Misc. Active Components	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	15000		
27.	Misc. Accessories as per req.	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000		
28.	Misc. Passive components.	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	15000		
29.	Working Models of analog and digital equipment	LS	LS	-	-	-	-	LS	LS	LS	LS	--	20000		
30.	Dark room with Camera, Enlarger, Developing setup, Fixing & Printing setup etc.	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	80000		
31.	Manual Etching Setup	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000		
32.	Mechanised Etching Setup	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000		
33.	Silk-Screen Printing Setup	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000		
S.No.	Name of the Equipment/ Board/Kit Etc.	Electron-ics Work-Shop		Electro-nics Inst. & Measurem ents Lab		Project		Total		Total No. Recommen- Piece ded		Rate per Piece		Total Cost	
		Intake		Intake		Intake		Intake		Intake		In Rs.		Intake	
		60	75	60	75	60	75	60	75	60	75		60	75	
34.	Drill Machine Power Operated	2	3	-	-	4	6	4	8	4	6	3500	14000	21000	
35.	PCB Drill Machine	2	3	-	-	4	6	6	9	4	6	500	2000	3000	
36.	Misc. Items	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	80000		
37.	Consumable(Not specified above)	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	258000		

LIST OF LABORATORY EQUIPMENT(Energy Conservation)

Sr. No	Particulars	Qty	Estimated Cost (Rs)
1.	Multimeter	1	17,000
2.	Power Analyzer	1	20,000
3.	Luxmeter	1	5,000
4.	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25,000
5.	Centrifugal pump, 1 kW	1	15,000
6.	Variable Frequency drive	2	50,000
7.	Water Flow meter	1	10,000
8.	Pressure Gauge	1	2,000
9.	Experimental Set up for Valve Throttling vs VFD	1	50,000
10.	Compressor, 20 cfm, single-stage	1	50,000
11.	Air leakage meter	1	18,000
12.	Blower (2 HP)	1	8,000

7.	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

Note :

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

ANNEXURE-1 QUESTIONNAIRE

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

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Electronics & Communication Engg.

PURPOSE: To design and develop Three Year diploma curriculum in Electronics & Communication Engg.

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 Electronics & Communication Engg. _____

6. Please give names of modern equipments/machines handled by a diploma holder in Electronics & Communication Engg.

- | | | |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

7. What proficiencies are expected from a diploma holder in Electronics & Communication Engg.

- | | | |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

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

- | | |
|--------------------------|--------|
| 1. Theoretical knowledge | -----% |
| 2. Practical knowledge | -----% |
| 3. Skill Development | -----% |

9. Do you think " on the job training" / Industrial training

Corrected and Approved By B.T.E. on Dated 04-05-2017

should form a part of curriculum. (Yes/ No)
 if yes then
 (a) Duration of training -----
 (b) Mode of training 1. Spread over different semesters
 2. After completion of course
 3. Any other mode

10. What mode of recruitment is followed by your organisation.

1. Academic merit
2. Written test
3. Group discussion
4. Interview
5. On the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Electronics & Communication Engg.

- | | |
|-----------------------------------------|-------|
| (a) Technical knowledge | ----- |
| (b) Practical skill | ----- |
| (c) Etiquettes and behaviour | ----- |
| (d) Aptitude | ----- |
| (e) Health, habit and social background | ----- |
| (f) Institution where trained | ----- |

12. Does your organisation have any system for the survey of Home articles of different countries/States. Yes/No

13. Does your organisation conduct field survey to know users views regarding. Yes/No

1. Home Articles for different age groups and sex.
2. Effect of climatic conditions
3. Any other
If yes ; Please give brief account of each.

14. Which type of assignment do you suggest for an entrepreneur in Electronics & Communication Engg.

15. In which types of organisations can a diploma holder in Electronics & Communication Engg. can work or serve.

- | | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

16. Job prospects for the diploma holder in Electronics & Communication Engg. the next ten years in the state / country.

17. In your opinion what should be the subjects to be taught to a diploma student in Electronics & Communication Engg.

Theory	Practical
--------	-----------

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.
If yes : Please give names of experts in your organisation to whom contact. | | Yes/ No |
| 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 Electronics & Communication Engg. | | |

(Signature)

Kindly mail the above questionnaire duly filled to:-

Shri 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- 2 FIELD EXPOSURE SCHEDULE

Just after the end of second year examination all the students will go for an industrial training for 4 weeks. It will be organised and supervised by the institution staff. Preferably govt. organisations like Doordarshan, AIR, Telephone, Post & Telegraph departments & Govt. undertakings e.g. UPTRON, I.T.I., B.E.L., H.A.L., C.E.L., be chosen for the training. Medium & small scale private industries may also be adopted for the training.

Training unit should in no way be less than a small scale industry so that the student may get training on different stages of production, testing quality control and assurance.

The training report submitted by the student should contain the following points applicable according to industry.

1. Name & Address of the organisation
2. Nature of the industry and its activity.
3. Date of
 - i. Joining
 - ii. Leaving
4. Details of the sections of the industry visited.
 - i. Name of tools, equipments instruments in use.
 - ii. Activities of the section
 - iii. Study of the components, devices used in complete assemblies.
 - iv. Soldering and de-soldering techniques used in circuit fabrication.
 - v. Study of PCB Lay out developing and preparation.
 - vi. Checking and testing of the components used.
 - vii. Final checking of the product.
 - viii. Discription of quality control measures taken in industry.
5. Study and acquaintance with transmission unit used in AIR, Doordarshan and other service organisation.

- i. Discription of faults occuring usually and their remedies.
- ii. Periodic maintenance schedule.
- iii. Major maintenance points in the unit.
- iv. Preventive Maintenance steps taken.

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

1. Presentations of Case Studies
2. Debate competitions
3. Poster competitions
4. Industrial visits
5. Visual Aids

COURSE OUTCOMES

After studying this course, a student will be able to co-relate and apply fundamental key concepts of energy conservation and energy management in industry, commercial and residential areas. A student will be able to:

- Define principles and objectives of energy management and energy audit.
- Understand Energy Conservation Act 2001 and its features.
- Understand various forms & elements of energy.
- Identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- Identify areas of energy conservation and adopt conservation methods in various systems.
- Evaluate the techno economic feasibility of the energy conservation technique adopted.

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

REFERENCE BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi&Shashank Jain published by TERI. Latest Edition
5. **Important Links:**
 - (i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
 - (ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
 - (iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
 - (iv) **Central Pollution Control Board (CPCB)**, Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.
 - (v) **Energy Efficiency Services Limited (EESL)**. www.eeslindia.org.
 - (vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.