W.B.S.C.T.E.

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA COURSES

COURSE NAME: ELECTRICAL ENGINEERING

COURSE CODE : EE

DURATION OF COURSE : 6 SEMESTER

SEMESTER: THIRD SEMESTER **SCHEME : C**

Sr.No.	SUBJECT	PERIODS			EVALUATION SCHEME							Credits
	THEORY	L	T	P	SESSIONSAL EXAM			ESE	PR(INT.)	PR (EXT.)		
					TA	CT	Total					
1	Electrical Circuit & Network	03	01	02	10	20	30	70	25	25		5
2	Electrical Machine I	03	__	03	10	20	30	70	25	50		5
3	Basic Electronics	03	--	02	10	20	30	70	25	25		4
4	Programming concept using C	02	--	02	5	10	15	35				3
5	Electrical Measuring Instrument	03	--	02	10	20	30	70	25	25		4
6	Electrical Workshop I	--	--	02	--	--	--	--	25	25		1
7	Elements of Mechanical & Civil Engineering	02			5	10	15	35				2
8	Professional Practices I	--	--	02	--	--	--	--	25	25		1
	Total	**16**	**01**	**15**	**50**	**100**	**150**	**350**	**150**	**175**		**25**

STUDENT CONTACT HOURS PER WEEK: **32**

HTEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH

, External Assessment @ , Internal Assessment ESE - End Semester Exam.

ABBREVIATIONS: CT- Class Test, TA - Teachers Assessment, L - Lecture, T - Tutorial, PR (INT.) – Practical (Internal) PR(EXT.)- Practical(External)

TA: Attendance & surprise quizzes = 6 marks. Assignment & group discussion = 4 marks.

Total Marks : 825

Minimum passing for sessional marks is 40%, and for theory subject 40%.

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1 Electrical Circuit & Network

Name of the Course: Electrical Circuit & Network			
Course Code: EE/CTN/S3		**Semester: Third**	
Duration: one Semester		**Maximum Marks: 150**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		Mid Semester Exam.: 20 Marks	
Tutorial: 1 hrs./week		Assignment & Quiz: 10 Marks	
Practical: 2 hrs./week		End Semester Exam.: 70 Marks	
		Practical : 50 Marks	
Credit: 5 (Five)			
Aim:			
Sl. No.			
1.	This subject finds utility in understanding the concepts in other electrical subjects such as Electrical Power System, Electrical Measurement and Instrumentation, & Electrical Machines etc.		
Objective:			
Sl. No.	The students will be able to:		
1.	Know and define the basic elements; electric circuit terminology; energy sources used in electrical circuit and also AC waveform and its various quantities.		
2.	Interpret the response of R,L,C elements to AC supply.		
3.	Calculate various parameters of AC Circuits.		
4.	Know Mesh and Node Analysis		
5.	Use Network Theorems for solutions of DC Networks		
6.	Interpret Transient Response		
7.	Use of Laplace Transform		
Pre-Requisite:			
Sl. No.			
1.	Series and parallel resistances, parallel & series cells		

Contents (Theory)		Hrs./Unit	Marks
Unit: 1	**Review of Basic Concepts of Electrical Circuit** 1.1 Electrical Circuit Elements R, L, C 1.2 Energy Sources 1.3 A.C. waveform and definition of various terms associated with it 1.4 Response of pure R, L, and C to AC supplies. 1.5 Vector representation of alternating quantity.	04	05
Unit: 2	**Single phase AC circuits** 2.1 Concept of complex impedance – Rectangular & polar form. 2.2 Series AC circuits R-L, R-C, R-L-C circuits. Impedance, Reactance, Phasor diagram, Impedance Triangle, Power Factor, Average power, Apparent power, Reactive power, Power triangle (Numerical).	12	20

	2.3 Series Resonance, Quality factor (Numerical) 2.4 Parallel AC circuits R-L, R-C and R-L-C circuits . Admittance, Susceptance, solution by admittance method, phasor diagram and complex Algebra method. (Numerical) 2.5 Comparison of series and parallel resonance.		
Unit: 3	**Principles of circuit Analysis (AC and DC circuits)** 3.1 Mesh Analysis (Numerical) 3.2 Node analysis with voltage current source. (Numerical)	06	10
Unit: 4	**Network Theorems(Statement, procedure, applications and areas of applications, simple Numerical)** 4.1 Source conversion/ideal voltage and current source 4.2 Superposition Theorem 4.3 Thevinin's Theorem 4.4 Norton's Theorem 4.5 Maximum Power Transfer Theorem	10	15
Unit: 5	**Transient Analysis** 5.1 Introduction 5.2 Simple R-L Circuit supplied from a DC voltage source 5.3 Simple R-C circuit supplied from a DC voltage source. 5.4 Time Constant.	08	10
Unit 6	**Laplace Transform** 6.1 Definition & Properties. 6.2 Laplace Transform of Unit Step, Impulse, Ramp, Exponential, Sine, Cosine Function. 6.3 Initial value and Final Value Theorem. 6.4 Applications of Laplace Transformations for solving differential equations describing simple circuits (Numericals)	08	10
Unit 7	**Pspice** 7.1 Pspice – Introduction and Simulation Approach (Theory only)		
	Total	**48**	**70**

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: i) Interpret results ii) Calculate values of various components for given circuits. ii) Select Instruments
2.	Motor Skills: i) Connect the instruments properly. ii) Take accurate readings. iii) Draw phasor diagram and graphs.

List of Laboratory Experiments:

Sl. No.	Laboratory Experiments
1.	To observe A.C. waveform on C.R.O. and calculate R.M.S. Values, frequency, Time periods.
2.	To determine the current and P.F. of R-L, R-C and R-L-C series circuit.
3.	To determine the current and P.F. of R-L, R-C and R-L-C Parallel circuit.
4.	To verify conditions for Series and Parallel Resonance.

5.	To verify Superposition Theorem applicable to D.C. and A.C. circuit.
6.	To verify Thevenin's Theorem applicable to D.C. and A.C. circuit.
7.	To verify Norton's Theorem applicable to D.C. and A.C. circuit.
8.	To verify Maximum Power Transfer Theorem applicable to D.C. and A.C. circuit.
9.	Application of Pspice : Calculation of network parameters, simulation of Transient response in R-L & R-C network.

Text Books

Sl No.	Name of Authors	Titles of the Book	Name of Publisher
1.	Edminister	Schaum online series Theory and problems of Electric circuits	T.M.G.H., Newyork
2.	D Roy Choudhury	Networks and Systems	Wiley Eastern Limited
3.	A.Chakraborty	Circuit Theory (Analysis and Synthesis)	Dhanpat Rai & Co.
4.	S.P. Eugene Xavier	Electric Circuit Analysis	New Age International Publishers
5.	S P Ghosh & A K Chakraborty	Network Analysis & Synthesis	T.M.H. Education Pvt. Ltd.
6.	K.S. Syresh Kumar	Electric Circuit and Networks	Pearson Education
7.	B.L.Theraja	Electrical Technology Volume-I	S.Chand & Co.
8.	Ravish R Singh	Network Analysis & Synthesis	T.M.H. Education Pvt. Ltd.

E X A M I N A T I O N S C H E M E (THEORITICAL)

GROUP	**UNIT**	**ONE OR TWO SENTENCE ANSWER QUESTIONS**				**SUBJECTIVE QUESTIONS**			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	**TO BE ANSWERED**	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	12	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	4,5,6,7	11				FIVE			

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Third Semester. **Distribution of marks: Performance of Job – 15, Notebook – 10.**
2. **External Assessment of 25 marks** shall be held at the end of the Third Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. **Distribution of marks: On spot job – 15, Viva-voce – 10.**

2 Electrical Machine – I

Name of the course : Electrical Machine – I	
Course Code :	**Semester : Third**
Duration : One Semester	**Maximum Marks : 175**
Teaching scheme :	**Examination scheme :**
Theory: 3 Hrs./ Week	Mid Semester Exam: 20 Marks
Practical: 3 Hrs./ Week	Assignment & Quiz: 10 Marks
	End Semester Exam: 70 Marks
	Practical: 75 Marks
Credit: 5 (Five)	

Aim:

Sl. No.	
1.	Students will be able to analyze the performance of DC motors and Transformers both qualitatively and quantitatively.
2.	These machines are used in different aspects in electrical power systems. So knowledge gained by the students will be helpful in the study of different technological subjects related with electrical machines & other electrical subjects.
3.	The knowledge and skills achieved from this subject will be helpful in discharging duties in industry and as R&D technician.

Objective:

Sl. No.	Student will be able to:
1.	Know the constructional details & working principles of DC machines & Transformers.
2.	Test DC machines & Transformers.
3.	Evaluate the performance of DC machines & Transformers by conducting different tests.
4.	Decide the suitability of DC machines & Transformers for particular purpose.

5.	Write specifications of DC machines & Transformers as required.
6.	Operate DC machines & Transformers as per requirement.

Pre-Requisite:

Sl. No.	
1.	Basic electrical engineering.
2.	Basic electronics engineering.

	Contents (Theory):	Hrs./Unit	Marks
Unit : 1	**1. GENERAL INTRODUCTION OF ROTATING MACHINE** 1.1 Mechanism of Electro-Mechanical energy conversion for generator & motor mode. 1.2 Space distribution of flux density and time-variation of voltage having salient & non-salient poles with DC excitation.	**03**	**04**
Unit : 2	**2. D.C. Generator:** 2.1 Working principles, Construction & Types of dc generator. 2.2 Armature winding types - Lap & Wave winding, 2.3 E.m.f equation, Methods of building up of e.m.f. (Numerical) 2.4 Armature reaction in DC machine. 2.5 Commutation method, Concept of reactance voltage. 2.6 Applications of D.C. generator.	**09**	**10**
Unit : 3	**3. D.C. Motor:** 3.1 Working principles, Back e.m.f., Speed and Torque equation. (Numerical) 3.2 Characteristics of Series, Shunt & Compound motors. 3.3 Methods of speed control of dc motors. (Numerical) 3.4 Starting methods of dc motor - 3-point & 4-point starter.	**09**	**10**

	3.5 Losses and Efficiency. 3.6 Applications of different types of dc motor. 3.7 Troubleshooting methods of dc motors (in brief).		
Unit : 4	**4. Single phase Transformer:** 4.1 Principle of operation. 4.2 E.m.f. equation, Transformation ratio, KVA rating. (Numerical) 4.3 Types of transformer, Core construction & different parts of transformer. 4.4 Concept of ideal transformer. 4.5 Different types of cooling methods (in brief). 4.6 Performance under no-load condition with phasor diagram. (Numerical) 4.7 Performance under load condition with phasor diagram. (Numerical) 4.8 Equivalent circuit. (Numerical) 4.9 Per unit representation of impedance. 4.10 Voltage Regulation at upf, lagging pf & leading pf. (Numerical) 4.11 Polarity test of transformer. 4.12 O.C. and S.C. tests - Estimation of losses & Equivalent circuit parameters. (Numerical) 4.13 Losses, Efficiency, Maximum efficiency, All-day efficiency. (Numerical) 4.14 Parallel operation of single phase transformers. (Numerical) 4.15 Tap-changing methods, Tap changers - Off load & On-load type. 4.16 Principles of single-phase Auto transformer - step-up & step-down, Comparison of weight, copper loss with 2-winding transformer. (Numerical) 4.17 Applications of 2-winding transformer & Auto transformer.	**17**	**30**

Unit : 5	**5. Three phase Transformer:** 5.1 Types of three phase transformer. 5.2 Construction. 5.3 Connections - Vector grouping (classification & necessity). 5.4 Concept of Tertiary winding and its utility. 5.5 Three-phase Auto transformer - working principle, connection diagram, practical application. 5.6 Scott-connected transformer – working principle, connection diagram, practical application. 5.7 Applications of 3-phase transformer.	**07**	**10**
Unit : 6	**6. Special purpose Transformer:** 6.1 Isolation transformer. 6.2 Welding transformer.	**03**	**06**
	Total	**48**	**70**

Practical:
Skills to be developed:
Intellectual skills:
1. Analytical skills.
2. Identification skills.
Motor skills:
1. Measurement (of parameters) skills.
2. Connection (of machine terminals) skills.
List of Practical:

1. To plot the O.C.C. of a D.C. generator & find the critical resistance.

2. To find the performance of a D.C. Series motor by conducting load test & draw the load characteristics.

3. To find the performance of a D.C. shunt motor by conducting load test & draw the load characteristics.

4. To compute the efficiency of a D.C. motor by Swinburn's test.

5. To control the speed of D.C. shunt motor above & below normal speed & draw the speed characteristics.

6. To determine equivalent circuit parameters of single-phase transformer by performing O.C. test and S.C. test.

7. To determine the regulation & efficiency of single-phase transformer by direct loading method.

8. To operate two single-phase transformers in parallel & find out the load sharing between them.

9. To perform heat run test of a single-phase transformer.

Text books:

Sl No.	Titles of Book	Name of Author	Name of Publisher
1.	Electrical Machines	S.K.Bhattacharya	T.M.H Publishing Co. Ltd.
2.	Electrical Technology- Vol-II	B.L.Thereja	S.Chand
3.	Electrical Machinery	Dr. S.K.Sen	Khanna Publisher
4.	Electrical Machines	J.B.Gupta	S.K.Kataria & Sons.
5.	Principles of Electrical Machines	V.K.Mehta, Rohit Mehta	S. Chand
6.	Electrical Machinery	P.S.Bhimbra	Khanna Publisher
7.	Electrical Machines	M.N.Bandyopadhyay	P.H.I. Pvt. Ltd.
8.	Electrical Machines	Ashfaq Husain	Dhanpat Rai & Co.
9.	Principles of Electrical Machines and Power Electronics	P.C.Sen	Wiley India
10.	Fundamentals of Electrical	B.R.Gupta & V.Singhal	New Age Publisher

	Machines		
11.	Electrical Machines	Nagrath & Kothari	T.M.Hill
12.	Electrical Technology	H.Cotton	C.B.S. Publisher New Delhi
13.	Electrical Machines	Smarajit Ghosh	Pearson

E X A M I N A T I O N S C H E M E (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	**TO BE ANSWERED**	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	09	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	4,5,6	13				SIX			

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Third Semester. **Distribution of marks: Performance of Job – 15, Notebook – 10.**
2. **External Assessment of 50 marks** shall be held at the end of the Third Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. **Distribution of marks: On spot job – 35, Viva-voce – 15.**

3 Basic Electronics

Name of the course : Basic Electronics	
Course Code :	**Semester : Third**
Duration : One Semester	**Maximum Marks : 150**
Teaching scheme :	**Examination scheme :**
Theory: 3 Hrs./ Week	Mid Semester Exam: 20 Marks
Practical: 2 Hrs./ Week	Assignment & Quiz: 10 Marks
	End Semester Exam: 70 Marks
	Practical: 50 Marks

Credit: 4(Four)	

Aim:

Sl. No.	
1.	This subject is the base of all advance electronics. It starts with semiconductor physics and P-N junction which makes the student to follow the functioning of all semiconductor based devices.
2.	Understanding of the subject will provide skill to the students for trouble shooting & testing of some basic electronic components and circuits.

Objective:

Sl. No.	Student will be able to:
1.	Describe the formation of P-N junction.
2.	Draw the characteristics of basic components like diode, transistor etc.
3.	Draw & describe the basic circuits of rectifier, filter, regulator & amplifier.
4.	Test diode and transistors.
5.	Read the data sheets of diode and transistors.

Pre-Requisite:

1.	Knowledge of physics and P-N junction.

Contents (Theory):		Hrs./Unit	Marks
Unit : 1	**1. Diode:** **1.1 Semiconductor Diode:** 1.1.1 Fundamentals of semiconductor – Energy bands (conduction & valence), Intrinsic & Extrinsic semiconductor, Concept of P-N junction, Diffusion, Barrier potential, Depletion region, Junction capacitance. 1.1.2 Forward & Reverse biasing of P-N junction, Diode symbol, Circuit diagram for characteristics of diode	**10**	**14**

	(Forward & Reverse), Characteristics of diode. 1.1.3 Diode specifications – Forward voltage drop, reverse saturation current, maximum forward current, power dissipation, package view of diodes of different power ratings. **1.2 Zener Diode:** 1.2.1 Construction, Symbol, Circuit diagram for characteristics of zener diode (Forward & Reverse), Zener & Avalanche Breakdown. 1.2.2 Zener diode specifications – zener voltage, power dissipation, break over current, dynamic resistance & maximum reverse current. **1.3 Other Diodes:** Shottky diode, Photo diode – operating principles & applications of each only.		
Unit : 2	**2. Rectifiers & Filters:** 2.1 Need of rectifier, Types of rectifier - Half wave & full wave rectifier (Bridge & Centre tapped). 2.2 Circuit operation of the rectifiers, Input & output waveforms for voltage & current, Average value of voltage & current (expression only), Ripple, Ripple factor, Ripple frequency, form factor, PIV of diode used, Rectifier efficiency. 2.3 Need of filters, Types of filter – a) Series inductor, b) Shunt capacitor, c) LC filter, d) π filter. 2.4 Circuit operation of the filters, limitations & advantages.	**07**	**10**
Unit : 3	**3. Transistors:** **3.1 Bipolar Junction Transistor (BJT):** 3.1.1 Symbol of NPN & PNP types, Construction, Operation of NPN and PNP transistor – current flow, relation between different currents. 3.1.2 Transistor amplifying action – Transistor configurations – CB, CE, CC, circuit diagram for input & output characteristics of each configuration, Input & output characteristics.	**10**	**14**

	Comparison between three configurations. 3.1.3 Transistor parameters – input & output resistance, α, β and relation between them. 3.1.4 Transistor specification – $V_{CE\ Sat}$, $I_{C\ Max}$, V_{CEO}, I_{CEO}, $V_{CE\ Breakdown}$, α, β, Power dissipation. **3.2 Field effect transistor (JFET):** Symbol, Construction of JFET, Working principle and V-I characteristics of JFET, pinch-off voltage, drain résistance, transconductance, amplification factor and their relationship. **3.3 Unijunction transistor (UJT):** Symbol, Construction, Working principle and characteristics of UJT, Equivalent circuit, UJT as relaxation oscillator, Applications.		
Unit : 4	**4. Biasing of BJT:** 4.1 Need of biasing, concept of DC load line, selection of Q point and stabilization. 4.2 Types of biasing circuits (concept only) – a) Fixed biased circuit, b) Base biased with emitter feedback, c) Base biased with collector feedback, d) Voltage divider biasing, e) Emitter biased.	**06**	**10**
Unit : 5	**5. Regulated Power Supply:** 5.1 Need of regulation, voltage regulation factor. 5.2 Concept of load regulation & line regulation. 5.3 Zener diode voltage regulator. 5.4 Linear regulators – 5.4.1 Basic block diagram of DC power supply.	**06**	**08**

	5.4.2 Shunt and series regulator using transistor – circuit diagram and operation. 5.4.3 Regulator IC's – 78xx, 79xx, 723.		
Unit : 6	**6. Small Signal Amplifiers:** 6.1 Small signal amplifier using BJT. 6.2 Determination of current, Voltage & Power gain, phase shift between input and output, Input and Output resistance, Graphical analysis of amplification. 6.3 AC load line. 6.4 Function of input & output coupling capacitors, emitter bypass capacitor. 6.5 Single stage CE amplifier with voltage divider bias – operation with circuit diagram. 6.6 Frequency response of Single stage CE amplifier, Bandwidth and its significance. 6.7 Need of Cascade (multistage) amplifiers, Gain of amplifier. 6.8 Types of amplifier coupling – RC, Transformer & Direct coupling.	**09**	**14**
	Total	**48**	**70**

Practical:
Skills to be developed:
Intellectual Skills:
1. Identification & selection of components.
2. Interpretation of circuits.
3. Understand working of basic instruments.

Motor Skills:

1. Ability to draw the circuit diagrams.
2. Ability to measure various parameters.
3. Ability to test the components using multimeter.
4. Follow standard test procedures.

List of practicals:

1. To be familiar with the following basic instruments**:** —
   Digital Multimeter, Oscilloscope, Power supply (single / dual channel), Function generator.
2. To plot the forward & reverse characteristics of P-N junction diode.
3. To construct half-wave & full-wave rectifier circuit & draw input, output waveforms.
4. To Plot the characteristics of Zener diode.
5. To study the Zener diode as voltage regulator & calculate load regulation.
6. To plot the characteristics of FET.
7. To plot the characteristics of UJT.
8. To plot the input & output characteristics of a BJT in CE or CB mode.
9. To construct a single stage CE amplifier circuit on a bread board to find out the gain and observe the input and output waveforms.
10. To construct a ±12V power supply on a bread board using IC regulator and observe the effect of filter circuit in output waveform by oscilloscope.

List of Text Books:

Sl. No.	Title of the Books	Name of Author	Name of Publisher
1.	Electronic Principles	Albert Malvino & D.J.Bates	T.M.Hill
2.	Electronic Circuits & Systems	Y.N.Bapat	T.M.Hill
3.	Basic Electronics	S.K.Mandal	T.M.Hill
4.	Electronic Devices & Circuits	David J.Bell	P.H.I. Pvt. Ltd.
5.	Basic Electronics for	S.Chowdhury	Dhanpat Rai & Co.

	Polytechnics		
6.	Electronics Engineering	J.B.Gupta	S.K.Kataria & Sons
7.	Electronic Devices & Circuits	P.John Paul	New Age International
8.	Electronic Devices & Circuits	Chereku & Krishna	Pearson Education
9	Basic Electronics	Debashis De	Pearson

E X A M I N A T I O N S C H E M E (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	**TO BE ANSWERED**	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	12	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	4,5,6	11				FIVE			

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Third Semester. **Distribution of marks: Performance of Job – 15, Notebook – 10.**
2. **External Assessment of 25 marks** shall be held at the end of the Third Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. **Distribution of marks: On spot job – 15, Viva-voce – 10.**

4 Programming concept using C

Name of the Course: Programming concept using C	
Course Code: EE/C/S3	**Semester: Third**
Duration: one Semester	**Maximum Marks: 50**
Teaching Scheme	**Examination Scheme**
Theory: 2 hrs./week	Mid Semester Exam.: 10 Marks
Practical: 2 hrs./week	Assignment & Quiz: 05 Marks
	End Semester Exam.: 35 Marks
	Practical : Nil
Credit: 3 (Three)	

Aim:	
Sl. No.	
1.	Programming concept finds utility in understanding the subjects such as Microprocessor, Microcontroller, PLC etc. It will also become helpful to understand various application Software such as Matlab, Pspice etc.
Objective:	
Sl. No.	The students will be able to:
1.	Define program and programming
2.	Briefly understand compiler, interpreter, linker and loader function.
3.	Understand algorithm and learn the different ways of stating algorithms.
4.	Understand the basic structure of a program in C
5.	Learn the data types, variables, constants, operators etc.
6.	Get to know the input and output streams that exist in C to carry out the input output task.
7.	Learn about decision type control construct and looping type control constructs in C.
8.	Learn about one dimensional array.
9.	Understand what a function is and how its use benefits a program
Pre-Requisite:	
Sl. No.	
1.	Basic units of computer system

Contents (Theory)		Hrs./Unit	Marks
Unit: 1	**Introduction to Programming: Algorithms and Flowcharts** 1.1 Programs and Programming 1.2 Programming Languages 1.3 Compiler, Interpreter, Loader, and Linker 1.4 Fourth Generation Languages 1.5 Structured Programming Concept 1.6 Key features of an Algorithm 1.7 Different ways of stating Algorithms	05	8
Unit: 2	**Overview of C Programming** 2.1 Introduction of C Language 2.2 Basic Structure of C 2.3 Working steps of C compiler – Source Code- Object Code – Executable	02	3
Unit: 3	**Types, Operator & Expression** 3.1 Introduction (Grammars/Syntax Rules) 3.2 Character Sets, Keywords, Identifiers, Constants, Variables 3.3 Data types and sizes 3.4 Different operators & expressions 3.5 Type conversions.	05	5
Unit: 4	**Managing Input & Output Operations** 4.1 Some input as well as output functions : scanf(), printf(), getchar(), putchar()	02	3
Unit: 5	**Control Flow (Decision Making)** 5.1 Introduction	06	6

	5.2 IF-ELSE statement 5.3 Looping : FOR,WHILE and DO-WHILE statements 5.4 BREAK, CONTINUE and GOTO statements. 5.5 Simple Program		
Unit 6	**Arrays** 6.1 Introduction 6.2 Declaration and initialization of Array 6.3 Accessing of array elements and other allowed operations. 6.4 Simple program with a one dimensional array	06	5
Unit 7	**Function** 7.1 The concepts of functions 7.2 Using functions : i) Function Declaration, ii) Function Definition, iii) Function Call 7.3 Simple program	06	5
	Total	**32**	**35**

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: i) Improvement of Logical thinking capability ii) Improvement of analytical thinking capability
2.	Motor Skills: i) Operate various parts of computer properly. ii) Problem solving skills. iii) Draw Flow charts

List of Laboratory Experiments:

Sl. No.	
	Write algorithm, Draw Flow chart, and Write programming codes in C on following topics
1.	To find the sum and identify the greater number between any two numbers.
2.	To interchange the numeric values of two variables.
3.	Take three sides of a triangle as input and check whether the triangle can be drawn or not. If possible, classify the triangle as equilateral, isosceles, or scalene
4.	To test whether the given character is vowel or not.
5.	To find sum of the digits of an integer .
6.	To find the roots of a quadratic equation.
7.	To check whether an input number is palindrome or not.
8.	To find the G.C.D and L.C.M of two numbers.
9.	To find the factorial of given number.
10.	To find the sum of n natural numbers.
11	To accept 10 numbers and make the average of the numbers
12	To accept 10 elements and sort them in ascending or descending order.
13.	To find the summation of three numbers using function.
14	To find the maximum between two numbers using function

Text Books

Sl No.	Name of Authors	Titles of the Book	Name of Publisher
1.	Pradip Dey and Manas Ghosh	Computer Fundamental and Programming in C	Oxford Higher Education
2.	T . Jeyapoovan	A first course in Programming with C	Vikas Publishing House Pvt. Ltd.
3.	K R Venugopal and S R Prasad	Mastering C	T.M.H. Publishing Company Ltd.
4.	Reema Theraja	Introduction to C Programming	Oxford University Press.
5.	E. Balaguruswamy	Programming in ANSI C	T.M.H. Publishing Company Ltd.
6.	Byron Gottfried	Schaum's Outlines Programming with C	T.M.H.
7.	Ashok N. Kamthane	Programming in C	Pearson

EXAMINATION SCHEME (THEORY)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	**TO BE ANSWERED**	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	5	TEN	ONE	1 X 10 = 10	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	FIVE	5 X 5 = 25
B	4,5,6,7	7				FIVE			

5 Electrical Measuring Instruments

Name of the Course: Electrical Measuring Instruments	
Course Code: EE/EMI/S3	**Semester: THIRD**
Duration: one Semester	**Maximum Marks: 150**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial:	Assignment & Quiz: 10 Marks
Practical: 2 hrs./week	End Semester Exam.: 70 Marks
	Practical : 50 Marks
Credit: 4 (Four)	

Aim:

Sl. No.	
1.	This subject finds utility in understanding the concepts in other electrical subjects such as Electrical Power System, Electrical Circuit Theory & Electrical Machines etc.
2.	The Diploma holder has to work as Technical supervisor, maintenance engineer, production engineer in industries, electrical power generation, transmission and distribution system, traction installation system, machine operation etc.
3.	For above job responsibilities he has to take the measurements of various electrical quantities power & energy for testing, monitoring, maintenance, and controlling the process. In addition to this he must know the calibration techniques and extension of meter ranges. Therefore Electrical Measurement skills are very important. Accuracy of measurement is one of the main parameters in industrial processes as ability of control depends upon ability to measure.

Objective:

Sl. No.	
1.	Identify the measuring instruments used for measuring electrical quantities.
2.	Classify measuring instruments based on construction, principle of operation and quantity to be measured, types of errors.
3.	Select appropriate measuring instrument with range for measurement of various electrical quantities. Select and use range multiplier if required.
4.	Select appropriate instrument for measurement of power, energy and Calibrate various types of instruments as per is.

Pre-Requisite:

Sl. No.			
1.	Knowledge of current, voltage & power and their measurements.		
Contents (Theory)		Hrs./Unit	Marks
Unit: 1	**Name of the Topic :Fundamentals of Measurement** 1.1 Purpose of measurement and significance of measurement. 1.2 Definition & brief explanations of: Range, sensitivity, true & indicated value, Errors (including limiting errors), Resolutions, Accuracy, Precision and instrument efficiency. 1.3 Classification of instruments: Absolute and secondary instruments, Analog (electro-mechanical and electronic) and digital instruments, secondary Instruments - Indicating, integrating & recording instruments. 1.4 Basic Requirements for measurements: Deflection torque and methods of production. Controlling torque and controlling system (Spring Control & Gravity control system) Damping torque & different methods of damping Balancing of moving parts. [No mathematical deductions – only the final expression (if any) to be mentioned]	6	8
Unit: 2	**Name of the Topic**: **Measurement of Current and Voltage** 2.1 Construction and principle of PMMC, MI & Dynamometer type Instrument. 2.2 Production of torque :methods. 2.3 Principles of Voltage and Current measurement. 2.4 Different Methods of range extension of Ammeter and Voltmeter & related problems. 2.6 Calibration of Ammeter and Voltmeter.	7	10
Unit: 3	**Name of the Topic**:**Measurement of Electrical Power** 3.1 Concept of power in A.C. Circuit 3.2 Principle and Construction of dynamometer type	9	15

	wattmeter. 3.3 Errors and their compensation. 3.4 Multiplying factor of wattmeter. 3.5 Measurements of power in 3 phase circuit for balanced and unbalanced load by one wattmeter method, two wattmeter method - problems 3.6 Effect of power factor variation on wattmeter readings in two wattmeter method -problems 3.7 Measurement of reactive power in three phase balance load by one wattmeter method and two wattmeter method. 3.8 Digital Wattmeter : Construction, Principle of Operation		
Unit: 4	**Name of the Topic** :**Measurement of Electrical Energy** 4.1 Concept of electrical energy. 4.2 Constructional feature & principle of working of single phase and three-phase induction type energy meter. 4.3 Different types of errors and their compensation. 4.4 Calibration and Testing of energy meter. 4.5 Electronic energy meter : Basic circuit diagram and principle of operation 4.6 Phantom loading |	7	10
Unit: 5	**Name of the Topic** : **Measurement of Circuit Parameters** 5.1 Classification of Resistance, Low, Medium and High. 5.2 Methods of Measurements of Low, Medium and High. Resistance by Kelvin Double bridge, Wheatstone bridge and Megger respectively--problems 5.3 Measurement of Earth resistance- Earth tester (Analog & Digital) 5.4 Digital Multimeter: Basic circuit diagram and	10	15

	working principle 5.5 Measurement of Inductance:---Maxwell's inductance bridge -- problems 5.6 Measurement of capacitance: Schering Bridge - Problems		
Unit: 6	**Name of the Topic : Constructional features and working principles of other Instruments/Meters** 6.1 Single phase and three phase Power Factor Meter(only dynamometer type). 6.2 Sychronoscope. 6.4 Clip-on-mmeter. 6.5 Instrument Transformers: Introduction and utility of using Instrument transformers (in the light of measurement and protection purposes) 6.6 CT (i) CT used in HV installations—multicore-secondary C.T (ii) Reduction of errors (Mention the various methods briefly). Accuracy class, Burden on CT, Specifications, Precautions in the use of CT 6.7 PT or VT Types – Mention the names with comparative study in brief. (Electromagnetic VT, CVT and CCVT) – basic circuit diagram of CVT, Working principle, Errors (concept only), Accuracy class, Burdens, Specifications, Precautions.	9	12
	Total	**48**	**70**

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
A.K. Sawhney	Electric & Electronic Measurement and Instrumentation		Dhanpatrai & Sons
Golding	Electrical Measurement &		Wheeler

	measuring Instrument		
N.V.Suryanaryan	Electrical Measurement & measuring Instrument		S. Chand & Co.
J.B. Gupta	Electrical & Electronic Measurements		S. K. Kataria Publication
Stout	Basic Electrical Measurement		
S.K.Singh	Industrial Instrumentation & Control		Tata McGraw Hill
David A.Bell	Electronic Instrumentation and Measurements		OXFORD Higher Education
P.Purkait, B. Biswas, S, Das, C. Koley	Electrical and Electronics Measurements and Instrumentation		Tata McGraw Hill

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: 1. Identification of instruments 2. Selection of instruments and equipment for measurement
2.	Motor Skills: 1. Accuracy in measurement 2. Making proper connections

Suggested list of Laboratory Experiments:

Sl. No.	Laboratory Experiments
1.	Measurement of Low resistance by Kelvin's Double Bridge.
2.	Measurement of active and reactive power in three phase balanced load by two wattmeter method and observe the effect of Power Factor variation on Wattmeter reading.
3.	Calibration of single phase Energy meter at various power factor by standard energy meter.
4.	Measurement of energy in single phase & three phase balanced load using Electronic Energy Meter.
5.	Measurement of inductance by Maxwell bridge.
6.	Determination of an unknown capacitance with the help of Schering Bridge network

7.	a) Measurement of Resistance, Voltage, Current, Voltage, Current in A.C & D. C. Circuit by using digital multimeter. b) Measurement of A.C. Current by Clip-on ammeter
8.	Measurement of power factor of single phase and three phase load by PF meter and verifying through I, V and P measurement.
9.	Determination of Q factor of Resonant circuit
10.	Measurement of current & voltages by low range ammeter & voltmeter respectively by using CT and PT.

E X A M I N A T I O N S C H E M E (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	**TO BE ANSWERED**	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	12	TWENTY	ONE	1 X 20 = 20	FOUR	TWO	TEN	10 X 5 = 50
B	4,5,6	11				FIVE	THREE		

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Third Semester. **Distribution of marks: Performance of Job – 15, Notebook – 10.**
2. **External Assessment of 25 marks** shall be held at the end of the Third Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. **Distribution of marks: On spot job – 15, Viva-voce – 10.**

6 Electrical Workshop I

Name of the Course: Electrical Workshop I	
Course Code: Ee/WS/S3	**Semester: THIRD**
Duration: one Semester	**Maximum Marks: 50**
Teaching Scheme	**Examination Scheme**
Theory:	**Practical : 50 Marks**

Tutorial:	
Practical: 2 hrs./week	
Credit: 1 (One)	

Aim:	
Sl. No.	
1.	A technician should also have the practical skills regarding wiring, in order to provide him/her the various ways, techniques of fault finding while working on the shop floor. These skills will be developed when he/she actually performs the work.
2.	
3.	

Objective:	
Sl. No.	
1.	Identify various electrical accessories.
2.	Draw & understand the wiring diagrams
3.	Prepare schedule of material
4.	Use methods of wiring

Pre-Requisite:	
Sl. No.	
1.	Studies of different types of wires, switches, circuits.
2.	Protection for safety of electrical wiring installation as per I.S.
3.	Protection against electric shock, thermal effect, over-current, over-voltage, under-voltage and against a measure of isolation and switching of electrical circuits.

Contents (Practical)	
Suggested list of Practicals/Exercises:	
Sl. No.	Practicals/Exercises
1.	Prepare & mount the energy meter board
2.	Wire up consumer's main board with ICDP & distribution fuse box & With ELCB / MCB
3.	Identification of diff. Windings of D.C. compound m/c.
4.	Study of constructional features and windings of D.C. m/c
5.	Study of D.C. motor starters
6.	Study of sodium vapour lamp, mercury vapour lamp, Compact fluorescent lamp and connections of these.
7.	Dismantling and assembling of a ceiling-fan/Table fan.
8.	To test a battery for its charged and discharged condition and to make connections for charging
9.	Wire up a test board
10.	Study the connection of fire-alarm
11.	Measurement of Insulation Resistance using megger.

STUDENTS ARE ASKED TO PERFORM AT LEAST NINE(9) Practicals/Excercises

E X A M I N A T I O N S C H E M E

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Third Semester. **Distribution of marks: Performance of Job – 15, Notebook – 10.**
2. **External Assessment of 25 marks** shall be held at the end of the Third Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. **Distribution of marks: On spot job – 15, Viva-voce – 10.**

7 Elements of Mechanical & Civil Engineering

Name of the Course: Elements of Mechanical & Civil Engineering			
Course Code: EE/EMCE		**Semester: Third**	
Duration: one Semester		**Maximum Marks:**	
Teaching Scheme		**Examination Scheme**	
Theory: 2 hrs/week		Mid Semester Exam.: 10 Marks	
Tutorial:		Assignment & Quiz: 05 Marks	
Practical:		End Semester Exam.: 35 Marks	
Credit: 2 (Two)			
Aim:			
Sl. No.			
1.	Diploma in Electrical Engineering passes outs, work as Maintenance Engineers in industry. They have to look after maintenance of Mechanical Machines also. Similarly they have to install electrical machinery. For completing these tasks they need knowledge of Mechanical Machinery related to maintenance and Civil Engineering related to foundation work.		
Objective:			
Sl. No.			
1.	• Supervise routine maintenance of Machinery such as Boilers, Turbines, Pumps, Steam Turbines		
2.	• Supervise foundation work for installation of machinery and equipment		
3.	• Identify faults, mal functioning of machines and equipment		
4.	• Decide the size and type of foundation for machines		
Pre-Requisite:			
Sl. No.			
1.	Studies of applied mechanics & Engineering Drawing.		
Contents (Theory)		Hrs./Unit	Marks
Unit: 1	**Boilers, Steam Turbines, Steam Engines:** 1.1 Layout of modern Steam Power Plant. 1.2 Definition and classification of Boiler and their applications.	08	8

	1.3 Working principle of Fire Tube (Cochran), water Tube (Babcock & Willcox Boiler) and Modern High Pressure Boiler. 1.4 Definition and classification of Steam Turbine. 1.5 Working Principle of impulse and reaction Turbine. 1.6 Reason for malfunctioning & remedial measures for boiler & turbine.		
Unit: 2	**I.C. Engines:** 2.1 Definition, Difference between Otto & Diesel Cycle 2.2 Working Principle of 2 stroke & 4 stroke Petrol & Diesel Engine, their differences and applications. 2.3 Reasons for malfunctioning & remedial measures for I.C. Engines.	06	7
Unit: 3	**Air Compressors:** 3.1 Definition, Classification & application of Air Compressor. 3.2 Construction & Working Principle of Single & two stage reciprocating Compressor. 3.3 Working Principle of Screw & Centrifugal Compressor. 3.4 Reasons for malfunctioning & remedial measures for Air Compressor.	06	7
Unit : 4	**Pumps:** 4.1 Classification of Pumps and their applications. 4.2 Working principle of Single acting & Double acting Reciprocating pump. 4.3 Working principle of Centrifugal Pump. 4.4 Reason for malfunctioning & remedial measures for Pumps.	06	6
Unit : 5	**Foundation for Machines:** 5.1 Need for Foundation. 5.2 Material required for Foundation & their Specifications. 5.3 Foundation Bolts: Types and Sizes 5.4 Criteria for Design of Foundation.	06	7
	Total	**32**	**35**

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
P.L. Ballaney	A Course in Thermal Engineering		Khanna Publishers

R. S. Khurmi	A test book of Thermal Engineering		S. Chand & Co. Ltd.
R. K. Rajput	Thermal Engineering		Laxmi Publication, New Delhi
Patel, Karmchandani	Heat Engine Vol. I & II		Achrya publication
P.K. Nag	Engineering Thermodynamics		Tata McGraw Hill
V.N.S. Murthy	Geotechnical Engg. Principles & Practices of Soil Mechanics & Foundation Engineering		C.R.C. Ptess Limited
Dr. B.C. Punmia	Soil Mechanics & Foundation Engg.		Standard Book House, New Delhi

EXAMINATION SCHEME

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	**TO BE ANSWERED**	MARKS PER QUESTION	TOTAL MARKS
A	1, 2	6	TEN	ONE	1 X 10 = 10	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	FIVE	5 X 5 = 25
B	3,4,5	6				FIVE			

8 Professional Practices I

Name of the Course: Professional Practices I	
Course Code: ELECTRICAL ENGINEERING	**Semester: Third**
Duration: one Semester	**Maximum Marks: 50**
Teaching Scheme	**Examination Scheme**
Theory:	Mid Semester Exam.: Marks
Tutorial:	Assignment & Quiz: Marks
Practical: 2 hrs / week	End Semester Exam.: Marks
	Practical : 50 Marks
Credit: 1 (One)	

Aim:	
Sl. No.	
1.	Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.
2.	While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.
3	The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.
Objective:	
Sl. No.	The student will be able to
1.	Acquire information from different sources
2.	Prepare notes for given topic
3.	Present given topic in a seminar
4	Interact with peers to share thoughts
5	Prepare a report on industrial visit, expert lecture
Pre-Requisite:	
Sl. No.	
1.	Desire to gain comparable knowledge and skills of various activities in various areas of importance.
2.	Eagerness to cohesively participate in group work and to share thoughts with group members.
3.	Knowledge of basic electrical engineering.

Activities

Sr . No.	Activities	Hours
1.	Industrial / Field Visit : Structured Field visits be arranged and report of the same should be submitted by the individual student, to form part of the term work. Visits to **<u>any TWO</u>** from the list below: i) Electrical machine manufacturing industry ii) Multistoried building for power distribution	**10**

	iii) Telephone Exchange iv) Transformer repair workshop. v) Foundry (to see furnaces and oven) vi) Food Processing industry (overall technical and other activities) vii) Tea processing industry. viii) District Industries Centre (to know administrative set up, activities, various schemes etc) ix) Cold storage / Rice Mill (operation, machineries, power distribution, chilling plant etc.) x) Community health Centre (organization, modus-operandi, various activities) xi) Panchayet/ BDO office to understand swarojkar yojona / gram sarak yojona scheme / Rural electrification and Report on a particular/ specific case. xii) Visit warehouse / Rail yard / port and observe Material Handling Management & documentation.	
2.	**Guest Lecture by professional / industrial expert**: Lectures by Professional / Industrial Expert to be organized from **any THREE** of the following areas: i) Free and open source software ii) Software for drafting iii) Cyber crime & Cyber laws iv)Social networking – effects & utilities v) Ethical Hacking. vi)Common electricity rules & norms(do's and don'ts) for all vii) Automobile pollution, norms of pollution control viii) Industrial Dispute & labour Law ix) Public health & Hygiene awareness. x) Working around trucks – loading and unloading of engineering machineries. xi) Industrial hygiene. xii) Special purpose wiring in chemical / hazardous industries.	**6**

	xiii) Safe application of electrical energy in daily life. xiv) Energy and environment xv) Carbon Trading. xvi) Challenges and opportunities in MSME sector. Individual report of the above lecture should be submitted by the students.	
3.	**Group Discussion:** The students should discuss in a group of six to eight students. Each group to perform **<u>any TWO</u> group discussions**. Topics and time duration of the group discussion to be decided by concerned teacher. Concerned teacher may modulate the discussion so as to make the discussion a fruitful one. At the end of each discussion each group will write a brief report on the topic as discussed in the group discussion. Some of the suggested topics are – i) Social networking – effects & utilities ii) Disaster management – role of electrical engineer iii) Energy saving in the institute iv) Use of plastic carry bag (social & domestic Hazard) v) Any other common topic related to electrical field as directed by concerned teacher.	**10**
4.	**Students' Activities:** The students in a group of 3 to 4 will collect information from market regarding specification and cost of items (at least five) used in electrical wiring for Domestic, commercial and industrial use. They will submit individual report on the same.	**6**

EXAMINATION SCHEME (SESSIONAL)

1. **Continuous internal assessment of 25 marks** is to be carried out by the teachers throughout the third semester. **Distribution of marks: Performance of job and attendance in guest lecturer = 15, Report = 10**

2. **External Assessment of 25 marks shall be held at the end of the Third Semester on the entire syllabus. Group discussion on any topic at the discretion of external examiner to be held by forming groups. Questions on field visit / guest lecture topic / students' activities will be asked. Distribution of marks: Group Discussion - 15, Viva-voce – 10.**