PART — II
3rd Semester

CURRICULAR STRUCTURE AND SYLLABI OF FULL-TIME DIPLOMA COURSES IN ELECTRICAL & ELECTRONICS ENGINEERING & TECHNOLOGY

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

(A Statutory Body under West Bengal Act XXI of 1995) "Kolkata Karigori Bhavan", 2nd Floor, 110 S. N. Banerjee Road, Kolkata – 700013

Further suggestion may be submitted to the syllabus committee. List of the coordinators for the branch of Diploma in Electrical & Electronics Engineering are:

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WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME: FULL TIME DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING

DURATION OF COURSE: 6 SEMESTERS

SEMESTER: THIRD

BRANCH: ELECTRICAL & ELECTRONICS ENGINEERING

SR. NO.	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR	@TW	Total Marks
						TA	CT	Total				
1.	**Electric Circuit & Network**	3	4	-	.-	10	20	30	70	-	-	100
2.	**Analog Electronics -I**	4	4		-	10	20	30	70	-	-	100
3.	**Electrical & Electronics Measuring Instrument**	3	3	-	-	10	20	30	70	-	-	100
4.	**Electrical Machine-I**	3	3	-	-	10	20	30	70	-	-	100
5.	**C Programming**	3	3	-	-	5	10	15	35	-	-	50
6.	**Circuit Theory & Network Analysis Laboratory**	1	-	-	2	-	-	-	-	50	-	50
7.	**Analog Electronics-I Laboratory**	2	-	-	3	-	-	-	-	50	-	50
8.	**Computer Programming Language Laboratory**	1	-	-	2	-	-	-	-	50	-	50
9.	**Electrical Machine-I Laboratory**	2	-	-	3	-	-	-	-	50	-	50
10.	**Electrical & Electronics Workshop-I**	1			2					50		50
11.	**Professional Practice - I**	1	-	-	2	-	-	-	-	-	50	50
	Total	24	17	-	16	50	100	150	350	250	50	800

STUDENT CONTACT HOURS PER WEEK:33 hrs, (Teaching-15 weeks + Internal Exam-2 weeks)

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH

ABBREVIATIONS: L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam, @TW-Term Work

TA (Teacher's assessment) = 10 marks: Attendance & surprise quizzes = 5 marks and Assignment & group discussion = 5 marks

TA (Teacher's assessment) = 5 marks : Attendance & surprise quizzes + Assignment & group discussion = 5 marks

Total Marks : 800

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

Assessment of Practical, Oral & term work to be done as per the prevailing norms of curriculum implementation & assessment.

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Name of the course: **Electric Circuit & Network**	
Course Code: EEE/ECN/S3	Semester: Third
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 3 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Tutorial: 1 contact hours / week	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
Practical: 2 contact hours/ week	End Semester Examination: 70 Marks
Credit: 5 (Five)	Practical: 50 Marks
Rationale:	
This subject finds utility in understanding the concepts in other electrical subjects such as Electrical Power System, Electrical Measurement and Instrumentation, & Electrical Machines etc.	
Objectives:	
1. 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. Analyze dc and ac circuits using Mesh and Node methods 5. Use Network Theorems for solutions of DC Networks 6. Interpret Transient Response 7. Use of Laplace Transform	

Content (Name of topic)		**Periods**	**Marks**
Group-A			
Unit 1	**Review of Basic Concepts of Electrical Circuit:**	04	05
	1.1 Electrical Circuit Elements R, L, C 1.2 Voltage and Current Source. 1.3 A.C. waveform and definition of various terms associated with it. 1.4 Voltage and current response and impedance diagram of pure R, L, and C to AC supply. 1.5 Phasor representation of alternating quantity.		
Unit 2	**Single phase AC circuits & Resonance:**	08+5(T)	15
	2.0 Study of J operator. 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, Active power, Apparent power, Reactive power, Power triangle, complex power (Numerical). 2.3 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)		

	2.4 Series resonance – Effects of varying inductance and capacitance in series RLC circuit – Selectivity- 'Q' factor. Resonance frequency – Bandwidth – Half power frequencies (numerical). 2.5 Parallel resonance – Two branch parallel circuits, Q factor- Resonance frequency-bandwidth (numerical) 2.6 Comparison of series and parallel resonance. RLC circuit – Selectivity- 'Q' factor. Resonance frequency – Bandwidth – Half power frequencies (numerical). 2.5 Parallel resonance – Two branch parallel circuits, Q factor- Resonance frequency-bandwidth (numerical) 2.6 Comparison of series and parallel resonance.		
Unit 3	**Principles of circuit Analysis (AC and DC circuits):**	06 +2(T)	10
	3.1 Mesh Analysis (Numerical) 3.2 Node analysis with voltage & current source. (Numerical)		
Unit 4	**Network Theorems(Statement, procedure, areas of applications and limitations)**	07 + 1(T)	10
	4.1 Source conversion/ideal voltage and current source 4.2 Superposition Theorem 4.3 Thevenin's Theorem 4.4 Norton's Theorem 4.5 Maximum Power Transfer Theorem (Numerical of all theorems)		
Unit 5	Transient Analysis:	08 +2(T)	10
	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. (Numerical)		
Unit 6	Laplace Transform:	08 +3(T)	10
	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 electrical circuits (Numerical)		
Unit 7	Two port network :	04 + 2(T)	10
	Open circuit Impedance and Short circuit Admittance parameters, Transmission parameters and their Interrelations.(Simple Numerical)		
	TOTAL	45 +15(T)	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: (At least Eight experiments are to be performed)	
Sl. No.	Laboratory Experiments
1.	To verify Kirchoff's Current Law and Kirchoff's Voltage Law.
2.	To measure inductance of a choke using an external resistance in series with choke and by drawing relevant phasor diagram. Verify the result with LCR meter and calculate Q factor.
3.	To measure the current , voltage across each element of R-L-C series circuit and draw the phasor diagram to calculate p.f.
4.	To measure the current , voltage across each element of R-L-C parallel circuit and draw the phasor diagram to calculate p.f.
5.	To verify conditions for Series and Parallel Resonance.
6.	To verify following network theorems applicable to D.C. circuit. i) Norton's Theorem ii) Maximum Power Transfer Theorem
7.	To study the basics of PSpice and know the important commands.
8.	To calculate network parameters of a simple d.c. circuit using Pspice.
9.	To simulate the d.c. transient response of R-L circuit using PSpice.

Examination scheme (Theoretical):

A) Internal Examination: Marks- 20

B) End Semester Examination: Marks-70

C) **Teacher's Assessment: Marks- 10**

(i) Marks on Attendance: Marks-05

(ii) Assignments & Interaction: Marks- 05

Group	**Unit**	**Objective questions** **Note: 10 multiple choice and 5 short answer type questions**			**Total Marks**
		To be set Multiple Choice (Twelve questions)	To be answered	Marks per question	
A	1,2,3	11	Any twenty	1	20 X 1 = 20
B	4,5,6,7	12			

Group	**Unit**	**Subjective Questions**			**Total Marks**
		To be set (Ten questions)	To be answered	Marks per question	
A	1,2,3	4	Any five (Taking at least one from each group)	10	10 X 5 = 50
B	4,5,6,7	5			

Note 1 : Teacher's assessment will be based on performance on given assignments & quizzes.

Note 2 : Assignments may be given on all the topics covered on the syllabus.

Sl. No.	**Name of the Author**	**Title of the Book**	**Name of the Publisher**
1.	Mahmood Nahvi & Joseph A Edminister	Schaum's outlines Electric circuits	McGrawhill Education (India)Pvt. Ltd.
2.	A. K. Chakraborty	Introduction to network, Filters and	Dhanpat Rai & Sons

		Transmission Lines	
3.	D Roy Choudhury	Networks and Systems	Wiley Eastern Limited
4.	S P Ghosh & A K Chakraborty	Network Analysis & Synthesis	T.M.H. Education Pvt. Ltd.
5.	M.S. Sukhija, T.K. Nagsarkar	Circuits and Network	Oxford University Press

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

Name of Subject: Network Analysis Laboratory **Full Marks-50**

Subject Code: EEE/LNA/S3

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 – 15, Viva-voce – 10.**

Name of the course: **Analog Electronics-1**	
Course Code: **EEE/AE1/S3**	Semester: Third
Duration: 6 months (Teaching-15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme :**
Theory: 5 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Tutorial: 2 contact hours / week	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
Practical: 3 contact hours/ week	End Semester Examination: 70 Marks
Credit: 6 (Six)	Prctical:50 Marks
Rationale:	
Electronics and its application play important role in our day to day life. Electronic components and circuits are used in most of the present day gadgets. Concept on analog electronics will pave easy way to understand operations and functioning of these gadgets also this subject is the basis of advance electronics. It starts with the idea of semiconductor materials, PN junction diodes which will enable the students to follow the functioning of all semiconductor devices. This is a core group subject and it develops cognitive and psychomotor skills.	
Objectives:	
The student will be able to- 1) Describe the formation of PN junction 2) Draw the characteristics of basic components like diode, transistor etc. 3) Draw and describe the basic circuits of rectifier, filter, regulator and amplifiers. 4) Know voltage amplifiers and its small signal analysis 5) Understand characteristics, operations and application of special types of diodes.	

Content (Name of topic)		Periods	Marks
Group-A		22	
Unit 1	**Semiconductor and Diode**	6	
	1.1 Electrical properties of semiconductor materials, energy level diagrams of conductor, semi conductor and Insulator. 1.2 Elemental and compound semiconductor Formation of P-Type and N-Type materials and their properties. Drift and diffusion current. Formation and behaviour of PN junction diode. 1.3 Zener diode, Zener breakdown & Avalanche Breakdown. Varactor diode, Schottky diode. 1.4 Diode wave shaping circuits – clipper and clamper circuits		
Unit 2	**Bipolar Transistor**	6	
	2.1 Formation and properties of PNP and NPN Transistor 2.2 Transistor configurations, input and output characteristics. α, β, and γ factors 2.3 Comparison of CB, CE, and CC configurations.		
Unit 3	**Transistor Biasing**	10	
	3.1 Concept of Q-point, ac and dc load lines 3.2 Stabilization and stability factor 3.3 BIASING**:** Base bias — Collector feedback bias — Emitter feedback bias — Potential divider bias. 3.4 Bias compensation circuits using diode and thermistors – Current mirror bias		
	Group-B	23	
Unit 4	**JFET, MOSFET AND UJT**	05	
	4.1 Difference between BJT, FET and MOSFET 4.2 Symbol and basic structure, Basic operation , VI characteristics and biasing of JFET, MOSFET –depletion and enhancement 4.3 basic structure and Basic operation , VI characteristics of UJT, Application of UJT 4.4 Relation between drain resistance, amplification factor and mutual conductance		
Unit 5	**Small Signal Transistor Amplifiers**	09	
	5.1 Hybrid model and h-parameters of CB, CE & CC mode transistor amplifiers – Calculation of voltage gain, current gain, power gain, input and output impedance in terms of h-parameters – Comparison of the three configurations. 5.2 Small signal FET equivalent circuits – Common source and common drain amplifier – FET application as VVR, constant current source etc. 5.3 Operation of VMOS & CMOS and power MOSFET – Precautions in handling MOSFET		
Unit 6	**Multistage Amplifier**	09	
	6.1 COUPLING: RC coupled – Direct coupled –Transformer-coupled amplifiers –		

	6.2 Effect on Gain & Bandwidth and Frequency response for cascading 6.3 Comparison of different types of cascading		
	GROUP-C	15	
Unit 7	**Power Amplifier**	7	
	7.1 Characteristics of Class A, Class B, Class C and Class AB amplifier 7.2 Difference between Voltage and Power Amplifier 7.3 TRANSFORMER COUPLED CLASS A POWER AMPLIFIER**:** Circuit operation – Calculation of power, efficiency & distortion 7.4 CLASS B PUSH PULL AMPLIFIER**:** Circuit operation – Calculation of power, efficiency & distortion – Crossover distortion – Advantages and disadvantages – Complementary symmetry and quasi-complementary symmetry Class B Push Pull Amplifier 7.5 Noise in amplifier circuits		
Unit 8	**Rectifier and Power Supply**	8	
	8.1 HALF WAVE AND FULL WAVE RECTIFIERS**:** Average voltage – R.M.S. voltage, efficiency and ripple factor – Percentage voltage regulation 8.2 Function of filter circuits – Capacitor input filter – Inductive filter – Π type filter – Calculation of ripple factor and average output voltage – Function of bleeder resistor 8.3 Series and shunt regulator using transistor – IC Voltage Regulators**:** Positive & Negative, their specifications 8.4 Voltage Multiplier :Voltage doublers – Tripler – Quadrupler – Their applications		
	TOTAL	60	

Practicals

Skills to be developed: On satisfactory completion of the course, the students should be in a position to design power supply, amplifier and other analog circuits.

Intellectual Skills:

1. Interpret the results
2. Verify the tables

List of Practical: Any SIX(including MINI PROJECT)

Suggested List of Laboratory Experiments

Sl. No.	
1.	To study the VI characteristics of a forward and reverse biased p-n junction Diode
2.	To study the VI characteristics of a reverse biased Zener diode
3.	To study the input and output characteristics and to find the h-parameters of a BJT for **: —** (a) C-E configuration, (b) C-C configuration, (c) C-B configuration
4.	To study the FET characteristics

5.	To study the MOSFET characteristics
6.	To study the rectifier with and without capacitor filter for **: —** (a) Half-wave rectifier, (b) Full-wave rectifier, (c) Bridge rectifier
7.	To determine frequency response characteristics of RC coupled amplifier circuit and calculation of bandwidth, midband gain, input impedance and output impedance for **:** (a) Single-stage amplifier, (b) Double-stage amplifier
8.	To study the output waveform of push-pull amplifier for Class-A, Class-B & Class-AB operations
9.	To study shunt and series regulator and draw the following plots: line regulation and load regulation
10.	To study the V-I characteristics of UJT (show the cut-off, saturation and negative resistance region)

MINI PROJECTS

List of MINI PROJECTS	
1.	To design a power supply
2.	To design a single stage OR double stage amplifier.

Examination scheme (Theoretical):

A) Internal Examination: Marks- 20

B) End Semester Examination: Marks-70

C) **Teacher's Assessment: Marks- 10**

(i) Marks on Attendance: Marks-05

(ii) Assignments & Interaction: Marks- 05

Group	**Unit**	**Objective questions** **Note: 10 multiple choice and 5 short answer type questions**			**Total Marks**
		To be set Multiple Choice (Twelve questions)	To be answered	Marks per question	
A	1,2,3	4	Any ten	1	10 X 1 = 10
B	4,5,6	4			
C	7,8	4			
		To be set short answer type (Ten questions)	To be answered	Marks per question	
A	1,2,3	4	Any five	2	5x2=10
B	4,5,6	4			
C	7,8	2			

Group	**Unit**	**Subjective questions**			**Total Marks**
		To be set (Ten questions)	To be answered	Marks per question	
A	1,2,3	3	Any five (Taking at least one from each group)	10	10 X 5 = 50
B	4,5,6	4			
C	5,6	3			

Note 1 : Teacher's assessment will be based on performance on given assignments & quizzes.

Note 2 : Assignments may be given on all the topics covered on the syllabus.

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

Name of Subject: Analog Electronics Laboratory **Full Marks** -50

Subject Code: EEE/LAE1/S3

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 – 15, Viva-voce – 10.**

	Text Books:		
Sl. No.	**Name of the Author**	**Title of the Book**	**Name of the Publisher**
1.	Malvino	Electronic Principles	Tata McGraw-Hill
2.	David A. Bell	Electronic Devices and Circuits	Oxford University Press
3.	Anil K. Maini	Electronics Devices and circuits	Wiley
4.	S. Salivanan	Electronic Devices and Circuits	Tata McGraw-Hill
5.	Millman & Halkias	Electronic Devices and Circuits	Tata McGraw-Hill
6.	Chattopadhyay & Rakhshit	Electronic Fundamentals and Applications	New Age Int
7.	Boylestad & Nashalsky	Electronic Devices and Circuits	Pearson
8.	Ganesh Babu	Linear Integrated Circuits	SCITECH
9.	Mottershed	Electronic Devices and Circuits	Prentice Hall of India, N. Delhi
10.	Bhargava	Basic Electronic & Linear Circuits	Tata McGraw-Hill
11.	Sahadeb	Electronic Principle	Dhanpat Rai & Sons
12.	M.L. Anand	Electronics Devices and Circuits	S.K. Kataria and sons
13.	Dr. T. Thygrajan	Fundamentals of Electrical and Electronics Engg	SCITECH
14.	Subhadeep Chowdhury	Fundamentals of Electronics	Paragon Publisher
15.	Premsingh Jakhar	Basic Electronics	Dhanpat Rai Publishing Co
16.	A. Dey Roy and D Dey Roy	Basic Electronics and Laboratory Manuals	Lakshmi Prakashani

Name of the course: **Electrical & Electronics Measuring Instrument**	
Course Code: EEE/ EEMI /S3	Semester: Third
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 3 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Tutorial: nil	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
Practical: 2 contact hours/ week	End Semester Examination: 70 Marks
Credit: 4 (Four)	Practical: 50 Marks
Rationale:	

Objectives: After successful completion of this course the students will be able to get familiar with the measurement fundamentals and instruments like electronic voltmeter, Multimeter, Q-meter, CRO, signal generator, spectrum analyzer etc.

	Content (Name of topic)	**Periods**	**Marks**
	Group-A		
Unit 1	**CLASSIFICATION OF DIFFERENT MEASURING INSTRUMENTS**	4	
	1.1 Distinguish between absolute and secondary instruments. 1.2 Differentiate among indicating, integrating and recording instruments. 1.3 State the different types of Measuring Instruments according to Principle of Working. 1.4 State the purpose and methods of obtaining deflecting, controlling and damping torques in indicating instruments. 1.5 State the methods of supporting moving system. 1.6 Describe the pointers and scales used in measuring instruments.		
Unit 2	**CONSTRUCTION AND WORKING OF DIFFERENT ELECTRICAL MEASURING INSTRUMENTS**	7	
	2.1 Describe the construction and working of Permanent Magnet Moving Coil instruments (No deduction needed). 2.2 Describe the construction and working of Moving Iron Attraction type & repulsion type instruments (No deduction needed) 2.3 Describe the construction and working of Electrodynamometer type instruments (No deduction needed) 2.4 Describe the construction and working of single phase Induction type energy meter. (No deduction needed). Knowledge of Meter Constant and common error adjustments for 1- phase energy meter. Phantom loading 2.5 Principle of rectifier type instrument – Average reading and peak reading		
Unit 3	**MEASUREMENT OF VOLTAGE, CURRENT AND POWER**	6	
	3.1 Measurement of voltage and current, use of voltmeter and ammeter, extension of range, simple problems. 3.2 Method of measuring power with wattmeter in Single - Phase circuit. 3.2. Measurement of 3-Phase Power and power factor using 2-Wattmeters method.		

	Simple problems 3.3 CT & PT: Use, specification, Precaution		
Unit 4	**MEASUREMENT OF RESISTANCE, INDUCTANCE, CAPACITANCE AND FREQUENCY : DC AND AC BRIDGES**	8	
	DC Wheatstone Bridge and its application – AC bridge-balance – Detection and source of excitation – Maxwell's induction bridge – Hay's bridge – Schering bridge – Wien Bridge (frequency measurement).		
Group – B			
Unit 5	**ELECTRONIC INSTRUMENTS**	**12**	
	5.1 Working principle of **D**igital **M**ulti **M**eter – successive approximation type, working and specification. 5.2 Digital display devices (LED, seven segment only), Concept of 3 ½ ,4 ½ digit. 5.3 Ramp type digital voltmeter- working principle and specification 5.4 Digital frequency meter. 5.5 Signal generator – specifications and uses of**:** Audio & Radio Frequency Signal Generator 5.6 C.R.O. – Block diagram representation & operation. Constructional features of CRT, Understanding dual trace oscilloscope. 5.7 Bolometer – Method of power measurement – Balance Bridge Bolometer		
Unit 6	**TRANSDUCER**	8	
	6.1 Basic concept of Transducers and its applications 6.2 Classification of Transducers 6.3 Basic working principle and application area (no deduction) of resistive (Potentiometer, strain gage), capacitive, inductive (LVDT), Hall effect transducer.		
	TOTAL	45	

Contents Practical

Suggested List of Laboratory Experiments

Group A (Any six)

Sl. No.	
1.	To study the operation and to use**:** (a) Multimeter (Analog and Digital), and, (b) Oscilloscope (Understand front panel control, observe voltage, frequency, phase difference)
2.	To study and use RLC meter and measure R,L,C,and Q factor
3.	To Study constructional feature of various types of instruments e.g. PMMC, MI, electrodynamometer and induction etc.
4.	To measure voltage, current and power in a single phase circuit using voltmeter, ammeter, and wattmeter.
5.	Measure 3 phase power using two wattmeter method.
6.	To connect a single phase energy meter and measure the energy consumption. Also study the meter constant.

7.	To measure L & Q by Maxwell Bridge
8.	To measure the unknown capacitance by Schering bridge
9.	To measure the unknown frequency by Wein Bridge.
Group B (Any four)	
10.	Study of different Lissajous pattern and determination of phase and frequency of unknown waveform
11.	To study the operation and to use**:** (a) AF signal generator; and, (b) RF signal generator
12.	To study the operation and to use frequency counter
13.	To study the operation and to use function generator
14.	To measure Linear displacement by LVDT & plot characteristics
15.	To measure displacement by Strain gauge & plot characteristics

Examination scheme (Theoretical):

A). **Internal Examination: Marks- 20 C). Teacher's Assessment, attendance and interaction/ quiz: Marks- 10**

B). End Semester Examination: Marks-70

Group	**Unit**	**Objective questions** **Note: 10 multiple choice and 5 short answer type questions**			**Total Marks**
		To be set Multiple Choice (Twelve questions)	To be answered	Marks per question	
A	1,2,3,4	7	Any ten	1	10 X 1 = 10
B	5,6	5			
		To be set short answer type (Eight questions)	To be answered	Marks per question	
A	1,2,3,4	5	Any five	2	5x2=10
B	5, 6	3			
Subjective questions **Note: 5 questions each of 10 marks each**					
		To be set	To be answered	Marks per question	**Total Marks**
A	1,2,3,4	5	3	10	30
B	5,6	4	2	10	20

Note 1 : Teacher's assessment will be based on performance on given assignments & quizzes.

Note 2 : Assignments may be given on all the topics covered on the syllabus.

Sl. No.	**Name of the Author**	**Title of the Book**	**Name of the Publisher**
1.	Kalsi	Electronic Instrumentation	Tata McGraw-Hill
2.	A.K. Sawhney	A Course in Electrical and Electronic Measurement and Instrumentation	Dhanpat Rai & Sons
3.	David Bell	Electronic Instrumentation and Measurement	Oxford University Press
4.	RK Rajput	Electronics Measurements & Instrumentation	S Chand

5.	Oliver Cage	Electronic Measurement and Instrumentation	McGraw Hill
6.	Wolf and Smith	Students Reference Manual for Electronic Instrumentation Lab	Prentice Hall of India
7.	J B Gupta	Electrical & Electronics Measurement	SK Kataria & Sons
8.	Brownes	Digital Instruments	Tata McGraw Hills
9.	U Sinha	Electrical & Electronics Measurements and Instrumentation	
10.	Cooper	Electronic Measurement and Measurement Technique	Prentice Hall of India

Name of the course: **C Programming**	
Course Code: EEE/ CPGM/ S3	Semester: Third
Duration: One Semester (Teaching-15 weeks + Internal Exam-2 weeks)	Maximum Marks: 50
Teaching Scheme:	Examination Scheme
Theory: 2 contact hrs./ week	Class Test (Internal Examination): 10 Marks
Tutorial: Nil	Teacher's Assessment (Attendance, Assignment & interaction): 05 Marks
Practical: 1 contact hours/ week	End Semester Examination: 35 Marks
Credit: 3 (Three)	Practical: 50 Marks

Rationale:	
Sl. No.	
1.	Programming concept finds utility in understanding of high-level language, low-level language and the subjects like Microprocessor, Microcontroller, PLC etc. This subject covers from the basic concept of C to the arrays and function in C. This subject will act as "programming concept developer" for students. 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)		Periods	Marks
	Group –A		
Unit: 1	**Introduction to Programming and overview of C** 1.1 CONCEPT OF PROGRAMMING LANGUAGES AND EXAMPLES 1.2 Algorithm and flowcharts 1.3 Compiler, Interpreter, Loader, and Linker 1.4 Source Code and Object Code 1.5 Place of C in computer language 1.6 Basic Structure of C	04	
Unit: 2	**Types, Operator & Expression** 2.1 3. C character set, tokens, constants, variables. keywords 2.2 PRIMARY DATA TYPES – their equivalent keywords and declaration 2.3 OPERATORS**:** Arithmetic – Increment – Decrement – Relational – Logical – Conditional – Bit Wise 2.4 Assignment statement- C expressions-operator precedence 2.5 UNFORMATTED I / O FUNCTIONS**:** getchar ( ) – getch ( ) — putchar ( ) – putch ( ) – gets ( ) –puts() FORMATTED CONSOLE I / O**:** printf ( ) – scanf ( )	08	
Unit: 3	**Control Flow (Decision Making)** 5.1 Introduction 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	06	
	Group-B		
Unit 4	**Arrays & Pointers** 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 6.5 Understanding pointers, declaring and accessing pointer ,'&' and '*' operators 6.6 Pointer expressions – Pointer assignments – Pointer arithmetic	08	
Unit 5	**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	
	Total	**32**	

	Contents (Practical)
Sl. No.	Skills to be developed
1.	Intellectual Skills: **Practical:** Skills to be developed: 1. Use of programming language constructs in program implementation. 2. Improvement of Logical thinking capability 3. To be able to apply different logics to solve given problem. 4. To be able to write program using different implementations for the same problem 5. Study different types of errors as syntax semantic, fatal, linker & logical 6. Debugging of programs 7. Understanding different steps to develop program such as ▪ Problem definition ▪ Analysis ▪ Design of logic ▪ Coding ▪ Testing ▪ Modifications and error corrections of programming language
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

Examination Scheme (theoretical):

A) Internal Examination: Marks- 10
B) End Semester Examination: Marks-35
C) **Teacher's Assessment: Marks- 5**
(i) Marks on Attendance
(ii) Assignments & Interaction

Group	**Unit**	**Objective questions** **Note: 10 multiple choice and 5 short answer type questions**			**Total Marks**
		To be set Multiple Choice (Ten questions)	To be answered	Marks per question	
A	1,2,3	6	Any six	1	6 X 1 = 6
B	4,5	4			
		To be set short answer type (eight questions)	To be answered	Marks per question	
A	1,2,3	3	Any four	1	4x1=4
B	4,5	3			

Group	**UNIT**	**Subjective Questions**			**Total Marks**
		To be set (Ten questions)	To be answered	Marks per question	
A	1,2,3	5	Any five (Taking at least two from each group)	5	5 X 5 = 25
B	5,6	3			

Note 1 : Teacher's assessment will be based on performance on given assignments & quizzes.
Note 2 : Assignments may be given on all the topics covered on the syllabus.

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

Name of Subject: Computer Programming Language Laboratory **Full Marks** - 50
Subject Code: EEE/LCPGM/S3

- **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.**
- **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 – 15, Viva-voce – 15.**

Text Books:			
Sl. No.	**Name of the Author**	**Title of the book**	**Name of the Publisher**
1.	Balgurusamy	Programming in 'C'	Tata Mc-Graw Hill
2.	Kanetkar	Let's 'C'	BPB
3.	Herbert Shieldt	Complete reference C	Tata Mc-Graw Hill

4.	Kernigham & Ritchie	The C Programming Language	Mc-Graw Hill
5.	H. Schieldt	C Made Easy	McGraw Hill
6.	T. Jeyapoovan	A first course in programming with C	Vikash Publishing House
7.	E Balaguruswamy	Programming in ANSI C (edition 2.1)	Tata McGraw-Hill

1. **Websites:**
   - http://cplus.about.com/od/beginnerctutoriali/a/blctut.htm
   - http://computer.howstuffworks.com/c.htm
   - Objective questions:
     1. http://www.indiastudycenter.com/studyguides/sc/objtest/default.asp

Demo lectures with power point presentations using LCD projector should be arranged to develop programming concepts of students.

Name of the course: Electrical Machine-1	
Course Code: EEE/EM1/S3	Semester: Third
Duration: One semester (Teaching-15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100
Teaching Scheme:	**Examination Scheme :**
Theory: 2 contact hrs./ week	Internal Examination (: 20 Marks
Tutorial:	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
Practical: 1 contact hours/ week	End Semester Examination: 70 Marks
Credit: 3	Practical:50
Rationale:	

This subject is restricted to second year diploma in Electrical & Electronics. Technicians / supervisors from all branches of engineering. They are expected to have some basic knowledge of major electrical equipments. Also the technicians working in different engineering fields have to deal with various types of electrical drives and equipment. Hence, it is necessary to study electric circuits, different types of electrical drives, their principles and working characteristics.

This subject covers analysis of ac and dc networks, working principles of commonly used ac and dc motors and their characteristics. The basic concepts studied in this subject will be very useful for understanding of other higher level subjects in further study.

Objectives:

The student will be able to-

1. Know importance, working and construction of single phase transformer
2. Explain construction, working, performance and applications of various types of DC Genrators and DC motors
3. Understand the idea of Polyphase circuits and star-delta connections
4. Gain principle of induction motor and construction
5. Identify and describe electrical hazards and precautions that should be taken to avoid injury in the workplace constituting electrical machine. Concept of electrical earthing.

Content (Name of topic)		Periods	Marks
Unit 1	**1. GENERAL INTRODUCTION OF ROTATING MACHINE**	02	04
	Mechanism of Electro-Mechanical energy conversion for generator & motor mode.		
Unit 2	**2. D.C. Generator**	10	12
	2.1 Working principles, Construction & Types of dc generator. 2.2 Function of Interpole & Compensating winding. 2.3 Armature winding types – Concept of Lap & Wave winding. 2.4 E.m.f equation, Methods of building up of e.m.f, Significance of Critical resistance and Critical speed (Numerical). 2.5 Concept of flux distribution in DC machine. 2.6 Armature reaction in DC machine (Concept only). 2.7 Commutation method, Concept of reactance voltage. 2.8 Applications of different types of D.C. generator.		
Unit 3	**3. D.C. Motor**	10	12
	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. 3.5 Losses and Efficiency (Numerical). 3.6 Braking methods of DC motor – Regenerative braking, Counter current braking, Dynamic braking. 3.7 Applications of different types of DC motor.		
Unit 4	**4. Single phase Transformer**	17	30
	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 and their function. 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.		

Unit 5	**5. Three phase Transformer:**	09	12
	5.1 Types of three phase transformer. 5.2 Construction of 3-phase transformer – Core & different types of Winding. 5.3 Connections of 3-phase transformer – Vector grouping (classification & necessity). 5.4 Concept of Tertiary winding and its utility. 5.5 Three-phase Auto transformer – working principle, connection diagram, Step-up & Step-down autotransformer. (Numerical) 5.6 Comparison of Autotransformer with two-winding transformer, practical application of autotransformer. 5.7 Scott-connected transformer – working principle, connection diagram, practical application. 5.8 Open delta connection – working principle, connection diagram, practical application. 5.9 Applications of 3-phase transformer.		
	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. Study the construction features of DC Machine
2. To control the speed of D.C. shunt motor above normal speed & draw the speed characteristics.
3. To control the speed of D.C. shunt motor below normal speed & draw the speed characteristics.
4. Study of three point and four point starter
5. To determine equivalent circuit parameters of single-phase transformer by performing (i) O.C. test (ii) S.C. test.

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 Machines	B.R.Gupta & V.Singhal	New Age Publisher
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
14.	Electrical Technology	E.Huges	ELBS
15.	Electrical Technology	H. Cotton	Pitman
16.	A Course in Electrical & Electronics Measurement & Instrumentation	A.K.Sawhney	Dhanpat Rai & Sons

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

A) Internal Examination: Marks- 10

B) End Semester Examination: Marks-35

C) **Teacher's Assessment: Marks- 5**

(i) Marks on Attendance

(ii) Assignments & Interaction

Group	**Unit**	**Objective questions** **Note: 10 multiple choice and 5 short answer type questions**			**Total Marks**
		To be set Multiple Choice (Ten questions)	To be answered	Marks per question	
A	1,2	4	Any six	1	6 X 1 = 6
B	3,4,5,6	6			
		To be set short answer type (eight questions)	To be answered	Marks per question	
A	1,2	3	Any four	1	4x1=4
B	3,4,5,6	3			

Group	**UNIT**	**Subjective Questions**			**Total Marks**
		To be set Multiple Choice (Ten questions)	To be answered	Marks per question	
A	1,2	3	Any five (Taking at least two from each group)	5	5 X 5 = 25
B	3,4,5,6	3			

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

Subject: Electrical Machine Laboratory **Full Marks-50**

Code: EEE/LEM/S3

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 – 15, Viva-voce – 10.**

Name of the course: Electrical & Electronics Workshop	
Course Code: EE/WS/S3	Semester: Third
Duration: 17 weeks (Teaching-15 weeks + Internal Exam-2 weeks)	Maximum Marks: 50
Teaching Scheme:	**Examination Scheme :**
Theory: Nil	Internal Teachers' Assessment: 25 Marks
Tutorial: Nil	External Teachers' Assessment: 25 Marks
Practical: 2 contact hours/ week	End Semester Examination: Nil
Credit: 1	
Rationale:	
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.	
Objectives:	
• Identify various electrical and electronics accessories.	
• Draw & understand the wiring diagrams	
• Prepare schedule of material	
• Use methods of wiring, testing and fabrication	
Pre-Requisite	
• Studies of different types of wires, switches, components and circuits.	
• Protection for safety of electrical wiring installation as per I.S.	
• Protection against electric shock, thermal effect, over-current, over-voltage, under-voltage and against a measure of isolation and switching of electrical and electronics circuits.	

Content (Name of topic)		Periods	Marks
Group-A			
Suggested list of Practicals /Exercises (practice **at least three from each group**, equal weightage to be given for both Group -A and Group - B)			
	Review of shop talks and safety precautions for both the basic electrical and electronics workshop practices		
Group A	**Electrical Workshop**		
1.	To study MCB, ELCB and RCCB and to know their applications.		
2.	To Study the constructional features and windings of different types of D.C. Machines To demonstrate the D.C. motor starters		
3.	To dismantle and assemble of AC motors and study the specifications of major components.		
4.	To test a battery for its charged and discharged condition and to make connections for charging and obtain its capacity.		
5.	To measure insulation resistance using Megger.		
Group B	**Electronics Workshop**		
6.	Testing of following semiconductor devices using test equipments: Diode, Zener diode, Transistor (NPN & PNP), Thyristor, Diac, Triac, UJT, JFET, IGBT, MOSFET		
7.	Identification, testing using IC tester and utilization of analog and digital (both TTL and MOS ICs).		
8.	To be familiar with the following basic instruments: — Analog and Digital Multimeter, Oscilloscope, Power supply (single / dual channel), Function generator, LCR Meter		
9.	To construct a ±12V power supply on Bread board and observe the output waveform by CRO with and without filter circuit. Also observe the output voltage using IC regulator 78XX & 79XX and fabricate the same using Vero board, necessary indicator, fuse etc., in a cabinet.		

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

Subject: Electrical & Electronics Workshop **Full Marks-50**

Code: EEE/WS/S3

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 – 15, Viva-voce – 10.**

Name of the course: Professional Practice-I	
Course Code: EEE/PP-II/S3	Semester: Third
Duration: 17 weeks (Teaching-15 weeks + Internal Exam-2 weeks)	Maximum Marks: 50
Teaching Scheme:	**Examination Scheme :**
Theory: Nil	Internal Teachers' Assessment: 50 Marks
Tutorial:	
Practical: 2 contact hours/ week	End Semester Examination: Nil
Credit: 2	
Rationale:	

In addition to the exposure both in theoretical and practical from an academic institution, it is desired that student should be familiar with the present day industry working environment and understand the emerging technologies used in these organisation. Due to globalization and competition in the industrial and service sectors, acquiring overall knowledge will give student an better opportunity for placement facility and best fit in their new working environment.

In the process of selection, normal practice adopted is to see general confidence, positive attitude and ability to communicate, in addition to basic technological concepts.

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.

Objectives:

The student will be able to-

Student will be able to:

1. Acquire information from different sources.
2. Enhance creative skills
3. Prepare notes for given topic.
4. Present given topic in a seminar.
5. Interact with peers to share thoughts.
6. Understand software for designing electronics circuits
7. Acquire knowledge of designing and maintenance of Electronics circuits, PCB and relevant software
8. Acquire knowledge on Open Source Software and its utility
9. Understand application of technologies in industry scenario.
10. Prepare a report on industrial visit, expert lecture.

Content (Name of topic)		Periods	Marks
Group-A			
Unit 1	**Field Visits**	12	
	Structured field visits (minimum three) be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The field visits may be arranged in the following areas / industries: i) Power supply/UPS/SMPS/Inverter manufacturing unit		

	ii) Electrical/Electronics Instruments calibration laboratories iii) Residential building for Electronic security systems iv) Small hydro power station **v)** Wind mill		
Unit 2	**Lectures by Professional / Industrial Expert to be organized from of the following areas (any four)**	10	
	i) Non conventional energy sources **ii) Open Source Software- an introduction and Practice session with Libre Office** • Introduction to Libre Office Writer • Introduction to Libre Office Calc • Introduction to Libre Office Impress • Introduction to Libre Office Base • Introduction to Libre Office Math • Introduction to Libre Office Draw iii) **OSCAD - Open Source EDA tool for circuit design, simulation and PCB design**. iv) Water pollution control v) Mobile communication vi) Various government schemes such as EGS, vii) Industrial hygiene. **viii)** Recent innovations of electronic gadgets in daily life		
	Seminar : Any one seminar on the topics suggested below: Students (Group of 4 to 5 students) has to search /collect information about the topic through literature survey, visits and discussions with experts / concerned persons: Students will have to submit a report of about 10 pages and deliver a seminar for 10 minutes. 1. Water supply schemes/Problems of drinking water in rural area 2. Problems related to traffic control 3. Electronic rolling display 4. Electronic systems used in Multiplex 5. Pani Panchayat Yojana for equal distribution of water **6.** Any other suitable topic	10	
	TOTAL	32	

Reference book for OSCAD

Sl No.	Titles of Book	Name of Author	Name of Publisher
1.	OSCAD	Yogesh Save, Rakhi R, Shambhulingayyan N.D., Rupak M Rokade, Ambikeswar Srivastava, Manas Ranjan Das, Lavita Pereira, Sachin Patil, Srikant Patnaik, Kannan M. Moudgalya	Shroff Publisher & Distributor

Website: (i) http://oscad.in

(ii) http:/spoken-tutorial.org of Indian Institute of Technology, Bombay (for more detail about Open source Software such as Libre Office, OSCAD and the like) **which is a part of National Mission on Education through ICT, MHRD Govt. of India.**

Demo lectures with power point presentations using LCD projector should be arranged for developing concepts on various topics.