PART- II

CURRICULUM OF DIPLOMA PROGRAMME

ON

ELECTRICAL & ELECTRONICS ENGINEERING (EEE)

IN

MULTI POINT ENTRY & CREDIT SYSTEM

For the State of Nagaland

Path Finder for Excellence in Technical Education

National Institute of Technical Teachers' Training & Research, Kolkata

Block - FC, Sector - III, Salt Lake City, Kolkata - 700 106

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June 2019

Sample path for Civil Engineering, Mechanical Engineering, Automobile Engineering, Electronics and Electrical Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Computer Engineering and information Technology.

SEMESTER -1

Sl. No	Code	Name of Course	Study Scheme				Evaluation Scheme							TotalMarks	Credit
			Pre-requisite	Contact Hours / Week			Theory				Practical				
				L	T	P	EndExam	Progressive Assessment			EndExam	Progressive Assessment			
								ClassTest	Assignment	Attendance		Sessional	Viva-voce		
1	G101	CommunicationSkill-I		2	0	2	75	10	10	5	-	25	-	125	3
2	G103	Mathematics-I		3	1	0	75	10	10	5	-	-	-	100	4
3	G106	Physics -1		3	0	2	75	10	10	5	25	25	-	150	4
4	G108	Chemistry -1		2	0	2	75	10	10	5	25	25	-	150	3
5	G201	EngineeringDrawing -1		1	0	4	-	-	-	-	25	25	-	50	3
6	G203	Workshop Practice -I		0	0	4	-	-	-	-	25	25	-	50	2
7	G205B	ComputerProgramming		2	0	4	50	-	-	-	25	50	-	125	4
TOTAL				**13**	**1**	**18**	**350**	**40**	**40**	**20**	**100**	**175**	**-**	**750**	**23**

*G205A is for CSE, IT and CPE

SEMESTER-II

Sl. No	Code	Name of Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory				Practical				
				L	T	P	End Exam	Progressive Assessment			EndExam	Progressive Assessment			
								ClassTest	Assignment	Attendance		Sessional	Viva-voce		
1	G102	CommunicationSkill-II	G101	2	0	2	75	10	10	5	-	25	-	125	3
2	G104	Mathematics-II	G103	3	1	0	75	10	10	5	-	-	-	100	4
3	G107	Physics - II	G106	3	0	2	75	10	10	5	25	25	-	150	4
4	G109	Chemistry - II	G108	2	0	2	75	10	10	5	25	25	-	150	3
5	G202	Engineering Drawing -II	G201	1	0	4	-	-	-	-	25	25	-	50	3
6	G204	Workshop Practice - II	G203	0	0	4	-	-	-	-	-	25	25	50	2
7	G206A	EngineeringMechanics	G106	3	0	2	75	10	10	5	-	50	-	150	4
8	G301	Development of Life Skill-I		1	0	2	-	-	-	-	-	25	25	50	2
9		Professional Practices -1#		0	0	2	-	-	-	-	-	50	-	50	1
TOTAL				**15**	**1**	**20**	**375**	**50**	**50**	**25**	**75**	**250**	**50**	**875**	**26**

Semester– III

Sl.no.	Sub. Code	Name of Course	Study Scheme				Evaluation Scheme								
							Theory Marks				Pract. Marks			Total Marks	Credits
			Pre-req.	L	T	P	EndExam	Progressive Assessment			EndExam	Progressive Assessment			
								ClassTest	Assignment	Attendance		Sessional	Viva-Voce		
1	EEE401	Circuits & Networks		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
2	EEE402	Electronics devices and Circuits I		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
3	EEE404	Digital Electronics		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
4	EEE405	Electrical Measurements & instrumentations		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
5	EEE407	Electrical Machines - I		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
6	EEE510	Professional Practice -II		*0*	*0*	2	*0*	*0*	*0*	0	*0*	*50*	*0*	*50*	*1*
7	G302	Development life skill-II		*1*	*0*	2	*0*	*0*	*0*	0	*25*	*25*	*0*	*50*	*2*
8	G105	Applied mathematics		*3*	*1*	*0*	*75*	*10*	*10*	5	*0*	*0*	*0*	*100*	*4*
9	G207	Fundamental Electrical & Electronics Engg.		*3*	*0*	*2*	*75*	*10*	*10*	5	*25*	*25*	-	*150*	*4*
Total				**22**	**1**	**16**	**525**	**70**	**70**	**35**	**175**	**225**	**0**	**1100**	**31**

SEMESTER - IV

Sl.no.	Sub. Code	Name of Course	Study Scheme				Evaluation Scheme								
							Theory Marks				Pract. Marks			Total Marks	Credits
			Pre-req.	L	T	P	EndExam	Progressive Assessment			EndExam	Progressive Assessment			
								ClassTest	Assignment	Attendance		Sessional	Viva		
1	EEE403	Electronics Devices and Circuits II		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
2	EEE406	Electronic Measurement & Instrumentation		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
3	EEE408	Electrical Machines II		*3*	*0*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*4*
4	EEE411	Electrical & Electronic Workshop Practice		*1*	*0*	*6*	*0*	*0*	*0*	-	*25*	*25*	*0*	*50*	*4*
5	EEE503	Power System		*3*	*0*	*0*	*75*	*10*	*10*	5	*0*	*0*	*0*	*100*	*3*
6	EEE409	Electrical Drawing using CAD.		*1*	*0*	*4*	*0*	*0*	*0*	-	*25*	*25*	*0*	*50*	*3*
7	EEE511	Professional Practice -III		*0*	*0*	*2*	*0*	*0*	*0*	-	*0*	*50*	*0*	*50*	*1*
8	*G303-G307*	*Soft-core-I (Environmental Education)*		*3*	*0*	*0*	*75*	*10*	*10*	5	*0*	*0*	*0*	*100*	*3*
Total				**17**	**0**	**18**	**450**	**50**	**50**	**25**	**125**	**175**	**0**	**800**	**26**

SEMESTER- V

Sl.no.	Sub. Code	Name of Course	Study Scheme				Evaluation Scheme								
							Theory Marks				Pract. Marks			Total Marks	Credits
			Pre-req.	L	T	P	EndExam	Progressive Assessment			EndExam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva-Voce		
1	EEE501	Microprocessors		*3*	*1*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	5
2	EEE502	Power Electronics		*3*	*1*	2	75	*10*	*10*	5	*25*	*25*	*0*	*150*	5
3	EEE410	Electrical Estimation and Costing.		*2*	*1*	*4*	*50*	*10*	*10*	5	*25*	*25*	*0*	*125*	5
4	EEE512	Professional Practice -4		*0*	*0*	*2*	*0*	*0*	*0*	-	*0*	*50*	*0*	*50*	*1*
5	EEE506	CommunicationEngineering		*3*	*1*	*4*	*75*	*10*	*10*	5	*25*	*25*	*0*	*150*	*6*
6	*EEE 601-606*	*Elective-I*		*3*	*0*	*4*	75	*10*	*10*	5	*25*	*25*	*0*	*150*	5
Total				**14**	**4**	**18**	**350**	**50**	**50**	**25**	**125**	**175**	**0**	**775**	**27**

SEMESTER-VI

Sl.no.	Sub. Code	Name of Course	Study Scheme				Evaluation Scheme								
			Pre-req.	L	T	P	Theory Marks				Pract. Marks			Total Marks	Credits
							End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								ClassTest	Assignment	Attendance		Sessional	Viva-voce		
1	EEE504	Switchgear & Protection		*3*	*0*	*0*	75	*10*	*10*	5	*0*	*0*	*0*	*100*	*3*
2	EEE505	Control Systems		*3*	*1*	*2*	75	*10*	*10*	5	*25*	*25*	*0*	*150*	*5*
3	EEE507	Testing and Maintenance of Machines andEquipment		*2*	*0*	*4*	*0*	*0*	*0*	-	*25*	*25*	*0*	*50*	*4*
4	EEE508	Project Work		*0*	*0*	*10*	*0*	*0*	*0*	-	*0*	*50*	*50*	*100*	*5*
5	EEE513	Professional Practice -V		*0*	*0*	*4*	*0*	*0*	*0*	-	*0*	*50*	*0*	*50*	*2*
6	*G303-G307*	*Soft-core-II (Entrepreneurship Development)*		*3*	*0*	*0*	*75*	*10*	*10*	**5**	*0*	*0*	*0*	*100*	*3*
7	*EEE601-606*	*Elective-II*		*3*	*0*	*4*	*75*	*10*	*10*	***5***	*25*	*25*	*0*	*150*	*5*
		Total		**14**	***1***	**24**	**300**	**40**	**40**	**20**	**75**	**175**	**50**	**700**	**27**

1	EEE514	Industrial Training of three weeks, preferably in two phases (after acquiring 100 credits)											***200***	***10***
		Total											**200**	**10**

SEMESTER - III

CIRCUITS & NETWORKS

L	T	P		Curr.Ref. No.:EEE-401	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE:**

The concept of electrical circuit and networks are very essential for the study of the other subjects in electrical and electronics engineering. This subject covers the basic electrical principle of DC and AC circuits. Electric circuit terminology, ac waveform and its various quantities, network theorems, interpret the response of R, L and C elements to single phase and three phase ac supply, calculate various parameters of ac circuit and network theorems have been covered in this subject. This subject finds utility in understanding the concepts in other electrical subjects such assuch as Electrical Power System, Electrical Measurement and Instrumentation, & Electrical Machines etc.

- **DETAILED COURSE CONTENT:**

UNIT	TOPIC/SUB TOPICS	HOURS
I	**1. Over View Of Circuits And Networks** 1.1. Electric Circuit Elements R,L,C 1.2. Energy Sources 1.3. Relation of R,L,C in series parallel	4
II	**2. Alternating Current Supply** 2.1. Sinusoidal ac voltage generation 2.2. Definition of various terms used in circuits and networks: amplitude, frequency, time period, RMS value, average value, form factor and peak factor	4
III	**3. Network Theorems** 3.1. Superposition theorem 3.2. Thevenin's theorem 3.3. Norton's theorem 3.4. Maximum power transfer theorem	5
IV	**4. Single phase AC circuit** 4.1. Response of basic R, L and C elements to a sinusoidal voltage and current 4.2. Average power. Apparent power, reactive power and power factor 4.3. Complex numbers - Rectangular and polar form and conversion between forms 4.4. Phasor Diagram	6

V	**5. 3 Phase A.C. circuit** 5.1. 3-0 generation 5.2. Phase sequences 5.3. Y and A connected generator 5.4. Star-Delta transformation 5.5. Balanced three phase supply with Y connected loads 5.6. Balanced three phase supply with A connected loads 5.7. Unbalanced three phase supply with Y connected loads	10
VI	**6. Analysis of Series and Parallel Circuits in AC supply** 6.1. Series - parallel circuits (voltage, current, power & P.F.) 6.2. Equivalent circuits 6.3. Effective resistance 6.4. Series a.c. circuits - Impedance and phasor diagram, series resonance, quality factor 6.5. Parallel a.c. circuits- admittance and susceptance, phasor diagram, parallel resonance, quality factor	10
VII	**7. Analysis of A.C. Networks** 6.1. Source conversion 6.2. Mesh analysis 6.3. Nodal analysis	6

- **SPECIFICA TION TABLE OF MARKS & HOURS DISTRIBUTION**

Abbreviations: K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	**Title**	**Hours**	**Marks**			
			K	**C**	**A**	**Total Marks**
1	Over View Of Circuits And Networks	**4**	4	-	2	**6**
2	Alternating Current Supply	**4**	5	3	-	**8**
3	Network Theorems	**5**	2	2	6	**10**
4	Single Phase AC Circuits	**6**	3	5	5	**13**
5	AC Circuits	**10**	4	4	4	**12**
6	Analysis Of Series And Parallel Circuits In AC Supply	**10**	2	4	6	**12**
7	Analysis Of A.C. Networks	**6**	-	4	10	**14**
	Total	**45**				**75**

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references
2. Laboratory manuals

- **LIST OF EXPERIMENTS**

1. To observe A.C. waveform on C.R.O. Calculates average and R.M.S. Values, frequency, Time Periods.
2. To verify Kirchhoff's law in DC circuit
3. To verify Thevenin's theorem in DC and AC circuit
4. To verify superposition theoremin DC and AC circuit
5. To verify Norton's Theoremin DC and AC circuit
6. To verify Maximum Power Transfer theorem in DC and AC circuit
7. To measure Resistor, Inductor and Capacitor using voltmeter and ammeter and plot the V-I Characteristics.
8. To measure the voltage and current in RLC series circuit and plot the phasor diagram

- **REFERENCE BOOKS**

S. No.	Title	Author/ Publisher/Edition/Year
1	Circuit theory Analysis and Synthesis	Chakrabarti: DhanpatRai Publishing
2	Schaum's Solved Problems in Electric Circuits - Book 1	Nasar, Syed ; McGraw-Hill, New York, latest
3	Schaum's Solved Problems in Electric Circuits - Book 2	Nasar, Syed ; McGraw-Hill, New York, latest
4	Introduction to electric circuits & machines	Pai, M.A., Affiliated East-West Press, New Delhi, 1st, 1991
5	Circuit & Networks: analysis & synthesis	Sudhakar, Tata McGraw Hill, New Delhi, 1st, 1994

ELECTRONICS DEVICES & CIRCUITS-I

L	T	P		Curr. Ref. No.:EEE-402	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE:**

Electrical and electronics Engineering cannot stand alone without the study of analog electronics which consists of different electronics devices and circuits. The modern electrical and electronics equipment are mostly controlled by electronic circuits where both the circuits are mostly designed on the basis of linear and binary operation of the solid state devices. This subject provides the facility for the study of the practical circuits is included in this subject rather than theoretical approach. Some problems on designing of simple electronic circuits have also been included here. This is a core group subject and it develops cognitive and psychomotor.

- **DETAILED COURSE CONTENT:**

Unit	TOPIC/SUB TOPICS	HOURS
I	**1. Semiconductor Diodes** 1.1. Semiconductor physics To describe 1.1.1. The properties of semiconductor 1.1.2. The principle of conduction in crystal 1.1.3. Doping 1.1.4. Unbiased diode 1.1.5. Forward and reverse biased diode 1.2. Characteristics and application of diodes 1.2.1. To describe the volt amp characteristics of diode 1.2.2. To explain the property of ideal diode 1.2.3. To define the resistance of diode &describe the method of measurements 1.2.4. To describe practical diode 1.2.5. To state the important specifications of semiconductor diode 1.2.6. To describe the half wave and full wave rectifier circuits 1.2.7. To calculate the efficiency of rectifier circuit 1.2.8. To write the formulae of calculating the parameters of filter circuit 1.3. **Special purpose diodes** 1.3.1. To describe the characteristics and field of application of (a) zener diode (b) capacitive diode (c) light emitting diode (d) photo diode (e) schottky diode (f) tunnel diode (g) PIN diode	10
II	**2. Bipolar Junction Transistor** 2.1. To describe the construction of transistor	15

	2.2. To describe the working principle of transistor 2.3. To state the types of transistor 2.4. To describe the characteristics of transistor and method of drawing characteristics curves 2.5. To describe the amplifying characteristics in (a) common base (b)common emitter (c) common collector configuration 2.6. To define (a) current amplification factor (b) collector current (c) emitter current (d) leakage current (e) input resistance (f) output resistance (g) base current amplification factor 2.7. To establish the relation between a and |3 2.8. To describe the method of drawing the (a) input characteristics curve (b) output characteristics curve 2.9. To compare the characteristics of three different configurations e.g. CB, CE, CC 2.10. To analyze the load line of a transistor (both for dc & ac) 2.11. To describe the function of the heat sink of a transistor. 2.12. To write the specification of a transistor. 2.13. To state the conditions for faithful amplification.	
III	**3. Biasing of BJT** 3.1. To define transistor biasing and essential requirement of a transistor biasing circuit. 3.2. To define the function of a small single stage amplifier, and calculate its voltage and power gain. 3.3. Classification of Amplifiers. 3.4. To define the multistage amplifiers and different type of coupling. 3.5. To describe the different types of power amplifiers 3.6. To describe and draw the different stages of an amplifier used in PA system. 3.7. To study the feedback amplifier (concept of feedback, gain in feedback, advantage & disadvantage in feedback amplifiers).	8
IV	**4. Sinusoidal Oscillators** 4.1. To state the type of electronic oscillators 4.2. To describe damped and un-damped oscillations 4.3. To state the conditions of oscillation 4.4. To study different types of oscillators like Hartley, Colpitt, Phase-shift, Wein Bridge and Crystal oscillators and their application.	10
V	**5. Wave Shaping Circuits** 5.1. To study the working of diode clipping and diode clamping circuit	2

- **SPECIFICA TION TABLE OF MARKS & HOURS DISTRIBUTION**

Abbreviations: K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	Title	Hours	Marks			
			K	C	A	Total Marks
1	Semiconductor Diodes	10	5	9	6	20
2	Bipolar Junction Transistor	15	10	10	4	25
3	Biasing of BJT	8	2	4	2	8
4	Sinusoidal Oscillators	10	2	10	-	12
5	Wave Shaping Circuits	2	2	8	-	10
	Total	**45**				**75**

- **LEARNING RESOURCES:**

1. Textbooks mentioned in the references
2. Laboratory manuals

- **LIST OF EXPERIMENTS:**

1. To identify the active and passive components
2. To determine the forward and reverse characteristics of PN junction diode
3. To determine the input and output characteristics of Junction transistor
4. To determine the forward and reverse characteristics of a zener diode
5. To connect the (a) common base (b) common emitter (c) common collector Amplifiers and to compare their gain
6. To assemble (a) two stage R.C. coupled (b) transformer coupled (c) Direct coupled amplifier and check the amplification of the input signal
7. To connect a single stage amplifier and check the cut off, saturation and normal biasing conditions on input signal by varying the biasing.
8. To determine the frequency response curve of a two stage R.C. coupled amplifier
9. To determine the (a) current amplification factor in common base configuration (b) basecurrent amplification factor in common emitter configuration
10. To determine the input and output characteristics of transistor, (a) draw the D.C. load line (b) draw the collector dissipation curve
11. To construct a multistage amplifier with (a) power Amplifier and check the amplification of input signal with and without negative feedback
12. Construct Hartley Oscillator and adjust (a) gain to obtain sinusoidal wave output and (b) L-C to vary the frequency (2) Determine the resonance frequency and amplitude of Oscillation
13. Construct a phase shift Oscillator and adjust its gain to obtain sinusoidal output. Determine (a) gain and (b) frequency of oscillation during Oscillation
14. Construct the diode clipping and clamping circuit and observe the clipping level with change in biasing voltage
15. Construct a differentiating and integrating circuit by using R-C network.

- **REFERENCE BOOKS**

1. Basic Electronics by S. K. Mandal, Mc Graw Hill Education
2. Electronic Principles by Sahdev, DhanpatRai& Sons
3. Electronic Devices and circuits by Mothershead, TMH
4. Electronic Devices by Floyd
5. Electronic Principles by Malvino, TMH
6. Electronics Fundamentals and Applications by D. Chottopadhyay and Rakshit.
7. Electronics Devices by G.K.Mithal.
8. Electronics Devices & Circuit theory by Robert Boyelstad.

DIGITAL ELECTRONICS

L	T	P		Curr.Ref. No.:EEE-404	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE:**

A lot of MSI, LSI, VLSI and Microprocessors have been developed and are being widely used in the Industrial Applications. To understand the functions of the above-mentioned chips it is required to learn the basic principles. So different topics of digital electronics have been included in this subject. As the field of Digital Electronics and Microprocessor is very vast the subject is divided into two parts. In the first part the study of fundamental principles, the study of combinational and sequential logic application of different IC chips have been included. The knowledge of digital to Analog and Analog to Digital converters are very essential for interfacing the analog to Digital System. So these topic have also been included.

- **DETAILED COURSE CONTENT**

UNIT	TOPIC/SUB TOPIC	HOURS
I	**1. Number system, radix conversion and binary codes:** 1.1. Definition of a) binary b) bit c)base or radix d)numeric code 1.2. Generalized equation for the conversion of a number from other systems to the decimal systems 1.3. Conversion of a number from other systems to the decimal system by using the generalized equation 1.4. Conversion a) decimal number to binary number b) octal to binary c) binary to octal d) hexadecimal to binary e) binary to hexa decimal f) octal to hexadecimal g) hexa decimal to octal number. 1.5. Classification of the numeric codes 1.6. Definition of a) weighted code b) BCD code c) Non-weighted code d) Non-error detecting code e) ring counter code f) excess three code g) Gray code h) Self checking code i) parity checking code j) error checking code k) simple error correcting code l) self-correcting code m) alphanumeric code. 1.7. Performing i) binary addition ii) binary subtraction iii) binary multiplication iv) binary division 1.8. Performing the a) 1's complement operation of binary number b) binary subtraction by using 1's complement	10

	operation c) 2's complement operation d) binary subtraction using 2's complement.	
II	**2. Digital Logic Circuit and Boolean algebra** 2.1. Description of (a) switching circuits (b) Logic gates (c) Symbols for logic gates (d) truth table for different type of gates 2.2. Realision of exclusive-OR in terms of basic building blocks 2.3. Universal building blocks and realisation of basic logic gates in terms of universal logic gates 2.4. Boolean Algebra for the verification De-Morgan's theorem and other Boolean Functions 2.5. Description of (a) sum of product (b) NAND gate realization (c) Product of Sum (d) NOR gate realization 2.6. Definition of (a) Minterm (b) Maxterm (c) canonical 2.7. Use of Karnaugh Map for simplification of Boolean equation (Karnaugh map utilizing Minterms and Maxterms)	8
III	3. **Combinational and arithmetic Logic Circuits** 3.1. Development of (a) Half Adder (b) Full Adder (c) Binary parallel Adder (d) Subtractor (e) Full & half subtractor (f) Adder / Subtractor in I's complement and 2's complement system (g) BCD addition and subtraction in 9's complement system (h) excess 3 adder and subtractor 3.2. Development of (a) comparators (b) Encoder (c) decoder, (d) multiplexing (e) demultiplexing (f) priority encoder (g) BCD to seven segment display decoder **3.3.** Application of above circuit	8
IV	4. **Sequential Circuits** 4.1. Development of a. Flip Flop using NAND or NOR gate (b) RS-Flip Flop (c) clocked RS Flip Flop (d) D Flip-Flop (e) Triggering of Flip-Flop (f) J-K Flip-Flop (g) T Flip-Flop (h) Master slave Flip-Flop 4.2. Application of the above circuits 4.3. Development of (a) Asynchronous or ripple counter (b) Modulo counter (c) synchronous counter (d) Divide by N counter (e) Decade counter (f) up-down counter (g) ring counter (h) Jhonson Counter 4.4.To state the application of above counters	10
V	5. **Shift Register** 5.1. Development of a) Shift Register (b) Buffer Register (c) Serial in serial out register (SISO) (d) Parallel in serial out shift Register (PISO) (e) Parallel in Parallel out shift Register (PIPO) (f) Bidirectional shift Registers (h) Universal Shift Register	4

	5.2. Connection diagram and application of IC Shift Registers	
VI	**6. Digital Memories** **6.1** Functions and applications of Digital memories like (a) RAM (b) ROM (c) PROM (d) PLA (e) FIFO	2
VII	7. **DA and AD converter** 7.1. Explanation of working principles of 7.2. D/A Converter with binary weighted register 7.3. D/A converter with R and 2 R resistors 7.4. Description of a practical circuit for using D/A converter in instrumentation and control circuit 7.5. Working principle of a) Successive approximation A/D converters b) Single and dual slope integration ADC c) Parallel type ADC 7.6. Practical circuit for using ADC in instrumentation and control circuit	3

- **SPECIFICA TION TABLE OF MARKS & HOURS DISTRIBUTION**

Abbreviations: K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	Title	Hours	Marks			
			K	C	A	Total Marks
1	Number system, Radix conversion and binary codes	10	5	2	8	15
2	Digital Logic circuit and Boolean Algebra	8	3	6	6	15
3	Combinational and Arithmetic Logic Circuits	8	-	8	2	10
4	Sequential Circuits	10	2	8	2	12
5	Shift Register	4	2	6	-	8
6	Digital Memories	2	3	3	-	6
7	DA and AD Converter	3	-	7	2	9
	Total	**45**				**75**

- **LEARNING RESOURCES**
  a) Textbooks Mentioned in the references
  b) Laboratories Manuals

- **LIST OF EXPERIMENTS**

A. Experiments by using Digital Trainer Kit

1. Verification of Truth Tables for AND, OR, NOT, Exclusive-OR gates
2. To develop exclusive-OR gate using basic building block
3. To develop the half adder and full adder circuit and verify the truth table
4. To connect a 4-bit parallel full adder circuit and verify the Truth Table

5. To connect four Flip Flop circuit to develop a four bit ripple counter
6. To connect a J.K. Flip Flop circuit and verify the truth table for various input of J and K
7. To connect 4 Flip Flop with "Pre" and “CLR” input terminal for developing different type of shift registers
8. To connect the 7492 counter chip to develop different module counter
9. To connect the 7490 decade counter with display decoder system for showing the counting operation
10. Connect the XOR circuit to develop parity bit checker

B. Experiments by using bread board and IC chips

1. To develop a 3 to 8 decoder circuit
2. To develop a set-reset Flip Flop by using 7400 (NAND Gate) chip
3. To develop a divide by 'N' counter by using 7473 chip
4. To develop a two digit counter by using 7490, 7448 and seven segment Display
5. Develop a 4 to 1 multiplexer circuit by using discrete chips
6. To develop a 4 digit multiplexed display counter by using MM 925 and other relevant components
7. To develop a up down counter circuit by using Flip Flops and AOI (And OR Invert) circuits
8. To connect the DAC chip MC1408 L or 0800 in the circuit to check the conversion process
9. To connect the ADC 7109 on the circuit to check the conversion process

- **REFERENCES BOOKS:**

- Digital Electronics Principles and Applications by S. K. Mandal, Mc Graw Hill Education.
- Digital Electronics and Microcomputers by R.K.Gaur, DhanpatRai
- Fundamental Engineering by Lionard S. Bobrow, Oxford
- Digital Principles and application by Malvino& Leach, TMH
- Elements of Computer Science by S. Srinivasan, New Central Book Agency Pvt Ltd

ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

L	T	P		Curr. Ref. No.:EEE-405	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE:**

The subject Electrical Measurement and Measuring Instruments is an important subject in the field of Electrical and Electronics Engineering and for the diploma holders those have to work as technical supervisor, maintenance engineer, production engineer in industries, electrical power generation, transmission and distribution system, traction installation system and machine operation etc. this subject deals with the technique of measuring voltage, current and powered by the indicating type instruments. The technique of measurement of electrical power in single phase and three phase circuits will be studied here. Measurement of energy and testing of energy meter will be studied under this subject. Prior to above the working principle, construction of all type of measuring instruments like indicating, integrating and recording type will also be studied here. Uses of ac bridges and other resistance measuring instruments are included under this subject.

- **DETAILED COURSE CONTENT:**

UNIT	TOPIC/SUB-TOPIC	HOURS
I	**1. Introduction to Electrical Measuring** 1.1. Purpose of measurement and significance of measurement 1.2. Various effects of electricity employed in measuring instruments. 1.3. Desirable qualities of measuring instruments Systems of Units 1.4. To indicate the units and dimensions of the following: frequency, speed, acceleration, force, work, energy, power, charge, potential reactance, Conductance, capacitance, inductance, magnetic field, flux density, magnetic flux.	**4**
II	**2. Types of Instruments** 2.1. To classify different type of instruments e.g. indicating integrating, and recording. 2.2. To describe type of(a) deflection system (b) Controlling System and (c) damping systems. 2.3. To describe the advantage and disadvantages of above mentioned systems. 2.4. To describe the constructional detail of pointer, control spring	**6**

	and Instrument bearings. 2.5. Types of errors 2.6. Different types of torque in Analog Instruments.	
III	**3. Construction and Working principles** 3.1. To describe the constructions, working principles for following instruments 3.2. moving coil instruments 3.3. moving iron instruments 3.4. Electrodynamics instruments (air cored and iron cored 3.5. Induction instruments 3.6. Electrostatic Instruments 3.7. Thermal instruments	**7**
IV	**4. Extension of Range of instruments and conversion** 4.1. To describe the method of extensions of range of ammeters and 4.2. To describe the method of extensions of range of Voltmeters (D.C Meters) 4.3. Describe the concept of Swamping resistor 4.4. To describe the method of extension of range of ammeter and voltmeter (A.C meters)	**5**
V	**5. Measurement of Resistance** 5.1. To classify the resistance according to the range values 5.2. To describe method of measurement of resistances 5.3. To state ammeter voltmeter method of measurement (Connection for ammeter for different ranges of resistance state the sources of error in different measurement techniques) 5.4. To state method of substitution for the measurement of resistance. 5.5. To state wheat-stone bridge principle of measurement of resistances with precautionary measures 5.6. To describe the Kelvin-Double bridge principle. 5.7. Deduce the expression for calculation for the value of unknown resistance. 5.8. Discuss the methods for eliminating the errors for measurements. 5.9. To describe the basic principles of series and shunt ohmmeter 5.10. To describe the constructions working principles of Megger. 5.11. State the type of Megger tester and their field of application (Insulation Tester & Earth Tester).	**10**
VI	**6. Measurement of Power** 6.1. To describe the method of connecting a wattmeter for measurement of single-phase power 6.2. To describe the method of measuring single phase power by (a) three ammeter and (b) three voltmeter method 6.3. To describe the method of measurement of p.f by using wattmeter, voltmeter and Ammeter in single-phase circuit. 6.4. To describe the method of three phase power by two wattmeter method	**4**

VII	**7. Energy Meter** 7.1. To describe the construction and working principle of D.C Energy meters 7.2. To describe the construction and working principles of Induction Type Energy Meter. 7.3. To describe the method of testing of Energy meter	**4**
VIII	8. **Bridges and Potentiometers** 8.1. To describe the principles of A.C Bridges on the following 8.2. Capacitance comparison Bridge 8.3. Describe the precautionary measure to be taken for high frequency measurement(Description of the method of Wagner's Earth Connection)	**4**

- **SPECIFICATION TABLE OF MARKS & HOURS**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

UnitNo.	Title	Hours	K	C	A	Total Marks
1	Introduction to Electrical Measurement	4	3	2	-	5
2	Types of Instruments	6	3	7	-	10
3	Construction and Working principles	7	-	12	-	12
4	Extension of Range of instruments and conversion	6	-	6	4	10
5	Measurement of Resistance	10	3	9	6	18
6	Measurement of Power	4	2	6	-	8
7	Energy Meter	4	-	6	-	6
8	Bridges and Potentiometers	4	-	6	-	6
	Total	**45**				**75**

- **LEARNING RESOURCES:**

1. Textbooks mentioned in the references
2. Laboratory manuals

- **LIST OF EXPERIMENT**

1. Dismantling and Assembly of indicating type instrument PMMC type, identification and drawing the following
2. deflecting system
3. Controlling System
4. Damping System
5. Dismantling and assembly of indicating type instrument e.g. Electro-dynamic Wattmeter, identification and drawing of (a) deflecting System(b) Controlling System

(c) Damping System (d) current coil (e) potential coil (f) voltage multiplier

6. Dismantling and assembly of indicating type instrument e.g. Moving Iron Voltmeter and Ammeter, identification and drawing of (a) deflecting system (b) Controlling System and damping system.
7. Dismantling and assembly of Single phase energy meter, identification and
8. drawing of (a) deflecting system (b) braking system (c) current coil (d) potential coil (e) creep adjustment (f) Pf adjustment (g) speed adjustment
9. Extension of Range of a PMMC voltmeter
10. Measurement of resistance by Wheatstone Bridge (and Kelvin's Double Bridge)
11. Measurement of Medium Value resistance by Ammeter Voltmeter method
12. Measurement of earth resistance.
13. Measurement of insulation resistance by Megger.
14. Use of potentiometer for the measurement ofResistance and EMF

- **REFERENCES BOOKS**

S.No.	Title	Author/ Publisher/Ed./ Year
1	Instrumentation for Engineering Measurements	Cerni& Foster; Tata McGraw Hill, New Delhi5th, 1986
2	Instrumentation for Engineering Measurements	Dally, J.W. et al; John Wiley & Sons, New York1st, 1984
3	Electrical & electronic measurement & instruments	Rambhadran, S,;Delhi: Khanna Publishers1st, 1994
4	Electronic Measurements & Instrumentation	Rao &Sutrave; NiraliPrakashan, Pune 2nd 1988
5	A course in electrical & electronic measurements and instrumentation	Sawhney, A.K., Delhi: Dhanpatrai& sons4th , 1987
6	A course in Electrical & Electronic Measurements & Instruments	Sawhney; Dhanpatrai& Sons, Delhi11th, 2000
7	Electrical measurements & measuring instruments	Suryanarayana, New Delhi, Tata McGraw Hill 1st, 1994

ELECTRICAL MACHINES-I

L	T	P		Curr. Ref. No.:EEE-407	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	25
Credit:		5		Progressive Assessment:	25

- **RATIONALE:**

This subject deals with the working principles and operation of electrical machine. The application of DC machines in modern industries are still in practice. The electrical engineering technicians has to look after the installations, operation and control of electrical machines. So the knowledge of electrical machine are very essential in this regard. As the field of electrical machine is very vast, this subject is divided into two parts electrical machine-I and Electrical machine-II. The Electrical Machines-I deals with DC machine and transformers, though modern industries are now-a-days uses ac motors and alternating mostly, the usage of dc machines like dc motors, generators are still in practice. The usage of transformers are also very widely used in industry so that these topics have been included in this subject.

- **DETAILED COURSE CONTENT:**

UNIT	TOPIC/SUB TOPIC	HOURS
I	**1. D.C Machine** 1.1. Construction & Working principle of D.C. Machines, Fleming's Right Hand and Left Hand Rule. 1.2. To describe the Magnetic Circuit in a D.C. Machine 1.3. To define geometrical axis and central axis. 1.4. To describe Armature Winding 1.5. To describe the brush positions 1.6. To define lap and wave winding 1.7. To state the field of application of Lap and Wave winding 1.8. To state the function of equalizing ring and dummy coils 1.9. To state the types of D.C. machines 1.10. On the basis of connection of field Coil with armature. 1.11. To define cumulative and differential compound machines.	10
II	**2. D.C Generator** 2.1. To describe the working principle of D.C. Generator 2.2. To write the emf. Equation of D.C. Generator 2.3. To state the method of determining O.C.C. curve of D.C. Generator (selfexcited) 2.4. To define critical resistance and critical speed 2.5. To describe the armature reaction 2.6. To state the method of reducing the effect of armature	10

	reaction 2.7. To describe the load characteristics of D.C. Generator 2.8. To state the application of D.C. Generator 2.9. To solve problems on D.C. Generator	
III	**3. D.C Motor** 3.1. To describe the working principle of D.C. Motor 3.2. To state the significance of back emf 3.3. To write the torque equation of D.C. Motor 3.4. To describe the characteristics of 3.5. Speed Vs. armature Current 3.6. Torque Vs. armature current 3.7. Speed Vs. torque characteristics. 3.8. Speed Vs. field current characteristics 3.9. To state the field of application of Different type of D.C .Motor 3.10. To state the basic principle of starting of D.C. Motors 3.11. To describe the speed control of D.C. Motor by 3.12. y varying field current ii) By varying armature voltage 3.13. To describe the speed reversal method of D.C. Motor solve the problems on D.C. Motor (specify the areas)	10
IV	**4. Transformer** 4.1. To define a Transformer & state its basic principle 4.2. To state the classification of transformer based on (application & construction) 4.3. To describe the construction of transformer 4.4. To prepare the list of components used 4.5. To describe the composition of the components 4.6. To state the type and nature of cooling of transformers 4.7. To describe the working principle of transformer. 4.8. To describe transformer on (a) no-load (b) full load 4.9. To derive the emf equation of transformer 4.10. To state the effect of leakage flux and leakage reactance of transformer 4.11. To describe the Phasor Diagram on no load (specify whether ideal or actual) 4.12. To describe the actual approximate equivalent circuit 4.13. To determine the equivalent resistance, reactance impedance referred to either side 4.14. To determine percentage resistance, reactance and impedance of transformer 4.15. To draw the phasor diagrams on load at different pf's 4.16. To describe different type of losses in transformer 4.17. To calculate the losses and efficiencies of transformer 4.18. To state the condition for maximum efficiency of transformer 4.19. To state the procedure for testing of transformer 4.20. To describe the open circuit test and short circuit test 4.21. To determine the voltage regulation of a transformer	15

	4.22. To describe the construction of Auto transformer 4.23. To describe the working principle of Auto transformer	

- **SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit. No.	Title	Hours	Marks			
			K	C	A	Total Marks
1	DC Machine	10	8	12	-	20
2	DC Generator	10	3	8	4	15
3	DC motor	10	4	8	3	15
4	Transformer	15	10	10	5	25
	Total	**45**				**75**

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references.
2. Laboratory manuals

- **PRACTICAL EXPERIENCES**

1. Dismantling of a d.c. machine and study its different parts.
2. Determination of No load characteristics/Drawing of OCC curve of D .C. Machine
3. Study of a single phase Transformer
4. Polarity Test on a single phase transformer
5. To determine the speed torque, speed armature current and torque armature current characteristics of a D.C. Motor (Shunt and Compound).
6. To control the speed of a D.C. Shunt Motor by (a) armature voltage Variation (b) field current variation.
7. To assemble and test the speed reversal circuit of a D.C. Shunt Motor
8. To study of transformer on No load and draw the no load phasor diagram
9. To determine the (a) no load loss (b) full load loss (c) efficiency and percentage regulation of a single phase transformer.
10. To determine the phasor diagram of transformer on load at different pfs

REFERENCES BOOKS

S.No.	Title	Authors& Publishers
1	Electrical Machines	B L Theraja
2	Electrical Machines	Bimbhra, P.S.; Khanna Publishers, New Delhi1996
3	Elementary Electrical Engineering	Gupta, M.L., New Heights, New Delhi18th, 1992
4	Basic Electrical Engineering	Mittle, V.N., Tata McGraw-Hill, New Delhi1990
5	Transformers	BHEL Bhopal; Tata McGraw-Hill, New Delhi1991

PROFESSINAL PRACTICES – II

L	T	P		Curr. Ref. No.:EEE-510	
0	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	0
Theory:		0	**Total Marks:150**	Progressive Assessment:	0
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	0
Credit:		1		Progressive Assessment:	50

- **RATIONAL**

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

AIM

Student will be able to:

- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

CONTENTS:

Activities

Industrial Visits

Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work.

TWO industrial visits may be arranged in the following areas / industries:

1) Manufacturing organizations for observing various manufacturing processes including heat treatment
2) Material testing laboratories in industries or reputed organizations
3) Auto workshop / Garage
4) Plastic material processing unit
5) ST workshop / City transport workshop

Lectures by Professional / Industrial Expert be organized from **ANY THREE** of the following areas:

i. Use of a plastics in automobiles.
ii. Nonferrous Metals and alloys for engineering applications
iii. Surface Treatment Processes like electroplating, powder coating etc.
iv. Selection of electric motors.
v. Computer aided drafting.
vi. Industrial hygiene.
vii. Composite Materials.
viii. Heat treatment processes.

ix. Ceramics
x. Safety Engineering and Waste elimination

Individual Assignments:
Any two from the list suggested

a) Process sequence of any two machine components.
b) Write material specifications for any two composite jobs.
c) Collection of samples of different plastic material or cutting tools with properties, specifications and applications.
d) Preparing models using development of surfaces.
e) Assignments on bending moment, sheer forces, deflection of beams and torsion chapters of strength of material.
f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.
g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes.
h) List the various properties and applications of following materials - a. Ceramics b. fiber reinforcement plastics c. thermo plastic plastics d. thermo setting plastics e. rubbers.

OR

Conduct **ANY ONE** of the following activities through active participation of students and write report

i. Rally for energy conservation / tree plantation.
ii. Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc.
iii. Conduct aptitude , general knowledge test , IQ test
iv. Arrange **any one** training in the following areas :
a) Yoga. B) Use of firefighting equipment and First aid

Maintenance of Domestic appliances.

Modular courses (Optional):
A course module should be designed in the following areas for max. 12 hrs. Batch size - min. 15 students.
Course may be organized internally or with the help of external organizations.

a) Forging Technology.
b) CAD-CAM related software.
c) Welding techniques.
d) Personality development.
e) Entrepreneurship development.

3-D Design Using Software
Computer screen, coordinate system and planes, definition of HP,VP, and reference planes How to create them in $2^{nd}/3^{rd}$ environment. Selection of drawing site & scale. Commands of creation of Line, coordinate points, Axis, Poly lines, square, rectangle, polygon, sp line,

circles, ellipse, text, move, copy, offset, Mirror, Rotate, Trison, Extend, Break, Chamfer, Fillet,Curves, Constraints fit tangency, perpendicularity, dimensioning Line convention, material conventions and lettering.

The Student should draw - different orthographic Views (including sections), Auxiliary views according to first/ Third angle method of projection. (Minimum two sheets, each containing two problems) after learning the contents as above.

DEVELOPMENT OF LIFE SKILL –II

L	T	P		Curr. Ref. No.: G 302	
1	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	0
Theory:		15	**Total Marks:50**	Progressive Assesment:	0
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	25
Credit:		2		Progressive Assesment:	25

- **RATIONAL:**

The nature of organization is changing at very rapid speed in this competitive world. In this situation the responsibility of diploma holder is not unique. He will be a part of a team in the organization. As such the individual skills are not sufficient to work at his best. This subject will develop the student as an effective member of the team. It will develop the abilities and skills to perform at higher degree of quality as an individual as well as a member of core group or team.
Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, and solving challenging problems. The subject is classified under Human Science.

- **DETAILED COURSE CONTENT**

UNITS	CONTENTS	HOURS
I	**1. Inter personal Relation** Importance, Interpersonal conflicts, Resolution of conflicts, Developing effective interpersonal skills communication and conversational skills, Human Relation Skills (People Skills)	2
II	**2. Problem Solving** **I) Steps in Problem Solving (Who? What? Where? When? Why? How? How much?)** 1. Identify, understand and clarify the problem 2. Information gathering related to problem 3. Evaluate the evidence 4. Consider feasible options and their implications 5. Choose and implement the best alternative 6. Review **II) Problem Solving Technique** 1) Trial and Error, 2) Brain Storming 3) Thinking outside the Box	10
III	**3. Presentation Skills** Concept, Purpose of effective presentations, **Components of Effective Presentations:**	10

	Understanding the topic, selecting the right information, organizing the process interestingly, Good attractive beginning, Summarizing and concluding, adding impact to the ending, **Use of audio visual aids** OHP, LCD projector, White board, **Nonverbal communication:** Posture, Gestures ,Eye contact and facial expression, Voice and Language Volume, pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language Handling questions Respond, Answer, Check, Encourage, Return to presentation **Evaluating the presentation** : Before the presentation, During the presentation, After the presentation	
IV	**4. Looking for a Job** Identifying different sources announcing Job vacancies, Skim, scan and read advertisements in detail, write efficacious CVs, write covering letters to a company CVs, write Job Application Letters in response to advertisements and self-applications	5
V	**5. Job Interviews** ***Prepare for Interviews:*** Intelligently anticipating possible questions and framing appropriate answers, Do's and don'ts of an interview(both verbal and non-verbal), **Group Discussion:** Use of Nonverbal behavior in Group Discussion, Appropriate use of language in group interaction, Do's and don'ts for a successful Group Discussion	10
VI	**6. Nonverbal graphic communication** Nonverbal codes: A. Kinesics B. Proxemics C. Haptics D. Vocalics E. Physical appearance F. Chronemics Artifacts Aspects of Body Language	6
VII	**7. Formal Written Skills:** Memos, Emails, Netiquettes, Business correspondence Letter of enquiry, Letter of Placing Orders, Letter of Complaint	6
	Total	**48**

	SESSIONAL ACTIVITIES	
Unit I. **Interpersonal Relation**	**Case Studies:** 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies	
Unit II **Problem Solving**	**Case Studies:** 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies	
Unit III **Presentation Skills**	Prepare a Presentation (with the help of a Power point) on a Particular topic. The students may refer to the Sessional activity (sl.No.8) of the Computer Fundamental syllabus of Semesterl. For engineering subject oriented technical topics the cooperation of a subject teacher may be sought. Attach handout of PPT in the sessional copy	
Unit IV **Looking for a job**	Write an effective CV and covering letter for it. Write a Job Application letter in response to an advertisement and a Self Application Letter for a job.	
Unit V **Job Interviews & Group Discussion**s	Writedown the anticipated possible questions for personal interview (HR) along with their appropriate responses Facemock interviews. The co-operation of HR personnels of industries may be sought if possible Videos of Mock Group Discussions and Interviews may be shown	
Unit 7 **Formal Written Skills**	Write a memo, Write an effective official e-mail, write a letter of enquiry, letter of placing orders, letter of complaint	

APPLIED MATHEMATICS

L	T	P		Curr. Ref. No.:G105	
3	1	0		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		60	**Total Marks:100**	Progressive Assessment:	25
Practical :		0		**Practical**	
Pre Requisite				End Term Exam:	0
Credit:		4		Progressive Assessment:	0

- **RATIONALE**:

Mathematics is an important tool to solve wide variety of engineering problems. Most of the technological processes in industry are described effectively by using mathematical framework. Mathematics has played an important role in the development of mechanical, civil, aeronautical and chemical engineering through its contribution to mechanics of rigid bodies, hydrodynamics, aero-dynamics and heat transfer etc. It has become of great interest to electrical engineers through its application to information theory, design of digital computer etc.

- **DETAIL COURSE CONTENT THEORY:**

UNIT	TOPIC/SUB-TOPIC	HOURS
I	**1. Numerical Analysis** **1.1 Interpolation**. Introduction to interpolation. Lagrange's interpolation formula. The operators, and .Relation between them. Difference Table. Newton's forward and backward interpolation formula. Concept of extrapolation. **1.2 Numerical Differentiation and Integration.** Newton's forward and backward difference formula for differentiation $\left(\frac{dy}{dx}, \frac{d^2y}{dx^2}\right)$at any point$x=x_o$ *or* $x=x_n$ **1.3. Numerical Integration**. (i) Trapezoidal rule and Simpson's rd rule. **1.4. Numerical Solution of Ordinary Differential Equation** Introduction. RungeKutta's 2nd and 4th order methods.	**15**
II	**2. Differential Equations (ordinary)** 2.1. Introduction. 2.2. Order and degree of a differential equation. 2.3. Formation of Differential Equations. 2.4. Solution of a Differential Equation. 2.5. Differential equation of the first order and first 2.6. Variables separable.	**15**

	2.7. Homogeneous Differential Equations. 2.8. Linear Differential Equations. 2.9. Equations reducible to linear form. 2.10. Exact differential Equations. 2.11. Equations reducible to the exact form. 2.12. Linear Differential Equations of second order with constant coefficients. 2.13. Complete solution = Complementary Function + Particular Integral. 2.14. Method of finding Particular Integral. 2.15. Applications of differential equations to electrical circuit problems. **2.16.** Problems related to other physical systems.	
III	3. **Graph Theory** 3.1. Introduction. 3.2. Basic Terminology. 3.3. Simple Graph, Multi-graph and Pseudo graph. 3.4. Degree of a Vertex. 3.5. Types of Graphs. 3.6. Sub-graphs and Isomorphic Graphs. 3.7. Operations of Graphs. 3.8. Paths, Cycles and Connectivity. 3.9. Eulerian and Hamiltonian Graph. 3.10. Shortest Path Problems using known Algorithm 3.11. Representation of Graphs. 3.12. Planar Graph. 3.13. Graph Colouring.	**20**
IV	4. **Discrete Mathematics** 4.1. The principle of Inclusion and Exclusion with examples 4.2. Generating Functions. 4.3. Introductory examples. 4.4. Definition and examples of Calculation Techniques 4.5. Partition of integers with problems. 4.6. Exponential Generating function with problems **Recurrence Relations.** 4.7. First order linear recurrence relations 4.8. Second order linear homogeneous recurrenceRelations with constant coefficients. 4.9. Non-homogeneous recurrence relations 4.10. Method of generating functions 4.11. Problems on all the above topics.	**10**

- **SPECIFICATION TABLE OF MARKS & HOURS**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit. No.	Title	Hours	K	C	A	Total Marks
1	Numerical Analysis	15	2	12	4	18
2	Differential Equations	15	2	15	4	21
3	Graph Theory	20	6	12	8	26
4	Discrete Mathematics	10	3	3	4	10
	Total	**60**				**75**

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references
2. Laboratory manuals

- **REFERENCE BOOKS:**

1. Integral Calculus by B.C.Das and B.N.Mukherjee.
2. Diploma Engineering Mathematics (Volume-II) by B.K.Pal.
3. Applied Mathematics-I by Dr.J.S.Bindra and K.S.Gill.
4. Applied Mathematics-II by Dr.J.S.Bindra and K.S.Gill.
5. Applied Mathematics-III by Dr.J.S.Bindra.
6. Engineering Mathematics (Volume-I, Volume-II & Volume-III)By S.Arumugam, A.ThangapandiIssac and A.Somsundaram.
7. Discrete and Combinatorial Mathematics by Ralph P.Grimaldi.
8. A TEXT BOOK OF DISCRETE MATHEMATICS by Swapan Kumar Sarkar.
9. Mathematics for Polytechnic by S.P.Deshpande.
10. Higher Engineering Mathematics by B.S.Grewal.
11. Introductory Method of Numerical Analysis by S.S.Sastry.
12. Calculus of Finite Difference and Numerical Analysis by Gupta-Malik.

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

L	T	P		Curr. Ref. No.:G 207	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite:				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE:**

For a diploma holder in electrical and electronics, communication and computer science engineering, it becomes imperative to know the fundamentals of the electrical and electronics in order to grasp the knowledge of the field. This subject will provide acquaintance with various terms, knowledge of fundamental concept of electricity, basic understanding of electronics components, their function and applications. This understanding should facilitate in operation and maintenance of equipment, which are used in various manufacturing process in industries, power system operation, communication system computer system. Etc.

- **DETAILED COURSE CONTENT:**

UNIT	TOPIC/SUBTOPIC	HOURS
I	**1. TECHNICAL TERMS AND DEFINITIONS WITH UNITS** 1.1. Electrical Current, Electrical pressure, Potential difference , Resistance 1.2. Factors affecting Resistance and temperature coefficient of resistance 1.3. Symbolic representation of sources, loads and basic protective devices 1.4. Conductors, Insulators and Semiconductors	3
II	**2. DC CIRCUIT** 2.1. Ohm's Law 2.2. Kirchhoff's current Law 2.3. Kirchhoff's voltage law 2.4. Analysis of series and parallel resistive circuits 2.5. Node voltage and loop current analysis 2.6. Power and Energy in such circuits. 2.7. Network Theorems-The venin's theorem 2.8. Norton's theorem 2.9. Maximum Power transfer theorem. 2.10. Superposition theorem. **2.11.** Illustrated examples in DC circuits	8
III	3. **FUNDAMENTALS OF A.C. CIRCUITS** 3.1. Generation of sinusoidal AC voltage	10

	3.2. Definition of average value, R.M.S. value, form factor and peak factor of sinusoidal 3.3. voltage and current 3.4. Meaning of lagging and leading of sinusoidal wave 3.5. Mathematical expression of sinusoidal voltage and current 3.6. Phasor representation of sinusoidal voltage and current 3.7. Definition of real power, reactive and apparent power 3.8. Power Triangle and power factor. 3.9. Analysis of R circuit with Phasor diagram 3.10. Analysis of R-L circuit with Phasor diagram 3.11. Analysis of R-C circuit with Phasor diagram 3.12. Analysis of R-L-C circuit with Phasor diagram 3.13. Illustrative examples involving series and parallel circuits 3.14. Necessity and advantages of three phase systems. **3.15.** Balanced supply and load in three phase systems.	
IV	**4. SEMICONDUCTOR AND DIODES** 4.1. Introduction to Semiconductors, energy band theories 4.2. Intrinsic and Extrinsic semiconductors 4.3. Potential barrier, 4.4. PN junction diode 4.5. Zener diode 4.6. V-I Characteristics of PN junction diode and Zener diode **4.7.** Introduction to LED, Varactor, Tunnel diode, Photo diode	4
V	**5. DIODE CIRCUIT APPLICATIONS** 5.1. Diode as rectifying element. 5.2. Operation of rectifiers: half and full wave rectifier. 5.3. Rectifier with filter circuits 5.4. Circuit applications of diode as clippers, clampers. 5.5. Zener voltage regulator circuits 5.6. Illustrated examples of diode circuits	6
VI	**6. BIPOLAR JUNCTION TRANSISTOR& FET** 6.1. Introduction to Transistor 6.2. V -1 characteristics of transistor 6.3. Transistor in active saturation and cut -off region 6.4. Transistor as amplifier 6.5. Introduction to FET 6.6. Construction of JFET 6.7. Mechanism of operation of a JFET 6.8. Characteristics of JFET 6.9. Compare JFETs and BJTs 6.10. Introduction to OP-AMP	6
VII	**7. NUMBER SYSTEM AND LOGIC GATES** 7.1. Introduction to digital system 7.2. Difference between digital and analog signals 7.3. Number system, binary , octal, hexadecimal, binary coded decimal 7.4. 1's and 2's complements arithmetic 7.5. Gray codes and excess 3 codes 7.6. ASCII code 7.7. Weighted codes	5

	7.8. Logic gates –OR, AND, NOT, NOR, NAND and XOR 7.9. Universal Logic gates 7.10. Illustrated examples related to number system and logic gates	
VIII	**8. BOOLEAN ALGEBRA** 7.8. Boolean variables 7.9. Boolean functions 7.10. Rules and laws of Boolean algebra 7.11. De-morgan's theorem 7.12. Algebraic reduction of Boolean expressions 7.13. Realizations of Boolean expression with logic circuit 7.14. Karnaugh Map techniques	3

- **SPECIFICATION TABLE OF MARKS & HOURS**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit. No.	Chapter Title	Hours	K	C	A	Total Marks
1	Technical terms and Definitions with Units	3	3	-	3	6
2	DC Circuits	8	4	2	4	10
3	Fundamentals of AC Circuits	10	3	4	5	12
4	Semiconductor and diodes	4	2	4	-	6
5	Diode Circuit Applications	6	2	6	2	10
6	Bipolar Junction Transistor and Field Effect Transistor	6	2	10	-	12
7	Numbers system and Logic Gates	5	3	4	4	11
8	Boolean Algebra	3	2	-	6	8
	Total	45				75

- **LEARNING RESOURCES:**

1. Textbooks mentioned in the references
2. Laboratory manuals

- **LIST OF EXPERIMENTS:**

1. To Observe AC waveform on CRO and to calculate average and RMs values, Frequency, Time Periods.
2. To verify Kirchhoffs Law in DC circuit
3. To verify thevenin's theorem in DC and AC circuits.
4. To verify Super -position theorem in DC and AC circuits
5. To verify Norton's theorem in dc and AC circuits
6. To verify maximum power transfer theorem in DC and AC circuit
7. To measure Resistor, Inductor and Capacitor using voltmeter and ammeter and plot

the V-I Characteristics.

8. To determine the forward and reverse characteristics of PN junction diode
9. To determine the input and output characteristics of junction transistor.
10. To determine the forward and reverse characteristics of Zener diode.
11. To Verify of Truth Tables for AND, OR, NOT, Exclusive-OR gates
12. To develop exclusive-OR gate using basic building block
13. To develop the half adder and full adder circuit and verify the truth table.
14. To verify De-morgans theorem.

- **REFERENCE BOOKS**

1. Text Book of Electrical Technology Vol-I by BL theraja, Khanna Publishers, Neww Delhi.
2. Basic Electrical Engineering Vol-I by P S Dhogal and SK Mandal, Tata McGraw-Hill, New Delhi.
3. Principles of Electrical and Electronics Engineering by VK Mehta, S. chand, New Delhi
4. Basic Electronics by JB Gupta, S.K Kataria and Sons, New Delhi
5. Basic Electronics by SK Mandal, McGraw-Hill, New Delhi
6. Principles of Electronics by AP Malvino, Tata MCGraw Hill, New Delhi.
7. Digital Electronics Principles and Applications by SK Mandal, Tat McGraw-Hill, New Delhi.

SEMESTER - IV

ELECTRONICS DEVICE AND CIRCUITS -II

L	T	P		Curr. Ref. No.: EEE 403	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE**

The application of Electronic Devices is increasing, not only in the field of electronics communication and instrumentation but it is also used in the field of electrical Engineering. In fact the field electronics is being amalgamated with the field of Electrical Engineering. So the study of Electronic Devices and circuits are very essential for the students of the Diploma course in Electrical Engineering. The part of this subject deals with the characteristics of basic devices like diode transistors and their circuits. The second part is dealing with the special devices e.g. UJT, FET, MOSFET, OPAMP, 555 timers and three terminal regulator chips. The study of CRO, Digital Multimeter and signal generators have also been included in this subject.

- **DETAILED COURSE CONTENT:**

UNIT	TOPICS/SUB-TOPICS	HOURS
I	**1. Uni-junction Transistor** 1.1. To describe the construction, working principle and characteristics of Uni-junction Transistor 1.2. To define (a) emitter current (b) negative resistance region (c) saturation region. 1.3. To describe the UJT relaxation Oscillator circuit and write expression for the time period of the oscillator 1.4. To state some application of UJT relaxation oscillator	**5**
II	**2. Field Effect transistor** 2.1. To describe the construction, operation and characteristics of Junction Field Effect Transistor 2.2. To define (a) channel Ohmic region (b) Pinch off region (c) Drain resistance (d) Trans conductance 2.3. To describe the effect of temperature on FET parameters	**5**
III	**3. MOSFET (Metal Oxide Semiconductor Field Effect Transistor)** 3.1. To describe (a) Depletion MOSFET (b) Enhancement MOSFET 3.2. To differentiate the characteristics of JFET and MOSFET 3.3. To describe (a) the handling precautions of MOSFET, (b) CMOS	**5**

IV	**4. Opto Electronic Devices** 4.1. To describe the Electromagnetic spectrum of Light 4.2. To list the application of photo Electronic Devices 4.3. To describe the photoconductive sensors e.g. 4.4. Bulk-type photoconductive cells 4.5. PN photodiode 4.6. PIN photodiode 4.7. Avalanche Photodiode 4.8. NPN Photodiode 4.9. NPN Phototransistor 4.10. Photo Darlington Transistor 4.11. To describe the applications of Photodiodes and phototransistors 4.12. To describe the function of light Emitters e.g. (a) LED's (b) Infrared Emitters (c) Laser diode 4.13. To describe the functions of (a) Photo-couplers (b) 4.14. Application of the photo coupler circuit	**10**
V	**5. Differential amplifier** 5.1. To define a differential amplifier and explain its significance 5.2. To describe four different configuration of the differential amplifier 5.3. To deference the voltage gain, differential input resistance and output resistance	**5**
VI	**6. Operational Amplifier** 6.1. To define operational amplifier 6.2. To draw the circuit symbol for a 741 Op-amp and show in number for each terminal. 6.3. To describe the power supplies required for Op-amp circuits 6.4. To define (a) input off set voltage (b) input off set current (c) common mode rejection ratio (d) large signal voltage gain (e) slew rate (f) output resistance (g) output short circuit current of operational amplifier 6.5. To state the seven important properties of the ideal Op-Amp 6.6. To define (a) open loop Op-Amp configuration (b) differential amplifier (c) inverting amplifier (d) non--inverting amplifier 6.7. To define (a) ground terminal (b) virtual ground 6.8. To draw the (a) inverting and non-inverting amplifier circuit 6.9. To calculate the close gain of (a) inverting and non-inverting amplifiers 6.10. To develop mathematical expression and state the applications of (a) adder (b) subtractor (c) integrator (d) differentiator circuit (e) voltage follower 6.11. To define comparator and show the output waveform for sinusoidal input and the reference voltage of (a) zero voltage (b) Positive voltage (c) negative voltage 6.12. Describe (a) zero crossing detector with hysteresis (b) voltage to current converter (c) currents to voltage converter 6.13. To explain the operation of a multi vibrator circuit and	**15**

	sketch its output voltage waveform and calculate the frequency of Oscillation 6.14. To develop a basic differential amplifier using Op- Amp 6.15. To develop basic differential amplifier using op-amp 6.16. To describe the (a) low pass (b) high pass and (c) Band pass filter	

- **SPECIFICATION TABLE OF MARKS & HOURS**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	Chapter Title	Hours	K	C	A	Total Marks
1	Uni-junction Transistor	5	3	2	2	7
2	Field Effect Transisitor	5	3	3	2	8
3	MOSFET	5	6	5	4	15
4	Opto Electronics Devices	10	3	2	3	8
5	Differential Amplifier	5	4	5	3	12
6	Operational Amplifier	15	8	7	10	25
	Total	45				75

- **LEARNING RESOURCES:**

1. Textbooks mentioned in the references
2. Laboratory manuals

- **LIST OF EXPERIMENTS:**

1. To draw the Emitter characteristics curve of the junction Transistor and identify cutoff, negative resistance region and saturation region of the device.
2. Construct a UJT Relaxation Oscillator circuit and (a) measure the peak value of (a) Curiffer voltage (b) output voltage (c) frequency of oscillation at different value of R.C.
3. To draw the (a) Drain currents for different values of Vos (b) Transconductance curve of JEFT.
4. Construct the (a) common source (b) common drain (c) common gate amplifier of JFET and compare their gains.
5. To construct the inverting amplifier and verify the gain of amplifier with various ratio of Ri and Rf. Also check the gain of input , output signals (use IC 741)
6. To construct the non - inverting amplifier and verify the gain of amplifier with various ratio of Ri and Rf. Also check the polarity of input output signals (use IC741)
7. Construct the adder and subtractor circuit using IC 741 and verify the output voltage with various input voltages
8. Construct an integrator circuit and note the output waveform for a square wave input
9. Construct a differentiation circuit and note the output wave form for a triangular input voltage.
10. To develop a comparator circuit and note the output waveform with sinusoidal input and (a)zero volt (b) positive voltage and (c) negative voltage inputs as the reference

input at the non-inverting input terminals.

11. To Develop a square wave / triangular wave generator circuit by using IC 741 as square wave generator and integrator
12. To develop (a) voltage to current and (b) current to voltage converter circuit and check and adjust its linearity
13. To use a IC 741 in differential mode and check its common mode rejection capability
14. To develop an instrumentation amplifier by using three IC 741
15. To establish an astable multi vibrator circuit by using IC 555
16. To establish a Monostable multi-vibrator circuit by using IC 555
17. To develop a pulse width modulator circuit by using a 555 timer
18. To develop a regulated power supply unit using (a) step down transformer (b) Four arm bridge rectifier (c)Filter and (d) three terminal 7800 group IC regulator
19. Perform the test for different load current and input voltage and determine percent regulation
20. Develop an adjustable d.c. Voltage regulator using LM 317
21. Use a 3 ^ digit digital Multi meter for measurement of (a) D.C. voltages (B) A.C. voltages (c) frequency of a signal (d) Value of resistor (e) value of inductors (f) value of capacitor
22. Use a 3 ^ digit digital Multimeter to perform the good bad test of (a) diode (b) transistor (c) SCR.
23. Use a 3 % digit digital Multimeter to measure (a) true RMS (B) Average and (c) peak value
24. of a rectified sine wave and find its form factor and peak factor
25. Use a dual trace CRO along with a signal generator to note (a) different type of wave forms of the output of signal generator (b) The amplitude and frequency of wave form (c) phase relation between two phase shifted wave forms

- **REFERENCE BOOKS:**

1. Basic Electronics by S. K. Mandal, Mc Graw Hill Education
2. Electronic Devices and Circuits by Allen Mother Shed, PHI
3. Operational Amplifier and Linear Integrated Circuit by Robert Conghlin, Frederick F. Drescolt, PHI
4. Op-Amp and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI
5. Electronics Fundamentals and Applications by D. Chottopadhyay and Rakshit.
6. Electronic Principles; Sahdev (DhanpatRai& Sons)
7. Electronic Devices; Floyd
8. Electronic Principles; Malvino; (TMH)
9. Electronics Devices by G.K.Mithal.
10. Electronics Devices & Circuit theory by Robert Boyelstad.

ELECTRIONICS MEASUREMENT & INSTRUMENTATIONS

L	T	P		Curr. Ref. No.: EEE 406	
3	0	2		**Theory:**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical:**	
Pre Requisite:				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE**

This subject deals with the technique of measuring voltage, current and wattage by the indicating & display type of instruments and CRO. The working principle, construction of all types of measuring instruments (indicating, integrating and recording) digital instruments are also covered. The general principles of build and handling of electronic instrumentation are also discussed.

- **DETAILED COURSE CONTENT:**

UNIT	TOPIC/SUB-TOPIC	HOURS
I	**1. Measurement Fundamentals** 1.1.Explanation of accuracy, precision, sensitivity, resolution, dynamic range, response and repeatability of measuring instruments. 1.2.Role of Units in measurements and different types of units - Type of errors - Definition of Primary and Secondary Standards - Concept of Calibration	**6**
II	**2. Electronic Voltmeter & Multi Meter** 2.1. Advantages of electronic voltmeter over ordinary voltmeter. 2.2. Working principle of Digital Multi Meter - Different types of DMM: Integration and successive approximation type. 2.3. Advantages of DMM over Conventional Multi Meter	**6**
III	**3. Measurement with CRO** 3.1. Dual Trace Oscilloscope : 3.2. Working Principle; Uses of Oscilloscope for frequency response measurement; 3.3. Digital Storage Oscilloscope : 3.4. Working Principle; uses in the field of Transient responses. 3.5. X-Y Display Unit: 3.6. Working Principle; Uses as phase measurement	**8**
IV	**4. Frequency Measurement** 4.1. Comparison method; Capacitor charge discharge method; 4.2. Pulse counting Method by Digital frequency meter; 4.3. Detail study of digital frequency meter.	**5**
V	**5. Phase Shift Measurement**	**6**

	5.1. Oscilloscopic Method 5.2. Null balance method 5.3. Phase shift to pulse conversion method 5.4. Phase shift measurement by pulse counting 5.5. Phase shift measurement by Intermediate frequency (IF) method **5.6.** Study of phase shifters	
VI	**6. Power Measurement** 6.1. Basic power measurement method 6.2. Power measurement method by terminating (absorption) method 6.3. Feed-through power measurement 6.4. Low-level power measurement	**6**
VII	**7. Signal Conditioning and Data Acquisition System (DAS)** 7.1. Need of signal acquisition circuit with measuring sensor. 7.2. Use of Op amp as inverting, non-inverting, summing, integrator, differentiator as signal conditioning after measuring sensor. 7.3. Instrumentation amplifier design, characteristics and application. 7.4. Introduction to DAS 7.5. Block diagram of multichannel DAS. 7.6. Application of DAS.	**8**

- **SPECIFICATION TABLE OF MARKS & HOURS**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	Chapter Title	Hours	K	C	A	Total Marks
1	Measurement Fundamentals	6	4	4	2	10
2	Electronics Voltmeter & Multi-meter	6	2	6	-	8
3	Measurement with CRO	8	2	7	3	12
4	Frequency Measurement	5	2	4	-	6
5	Phase Shift Measurement	6	2	7	3	12
6	Power Measurement	6	4	8	-	12
7	Signal Conditioning and Data Acquisition System (DAS)	8	3	8	4	15
	Total	**45**				**75**

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references
2. Laboratory manuals

- **LIST OF EXPERIMENTS**

1. Use (a) 3/ Digit (b) 3% Digit (c) 4 4/5 Digit Digital Multimeter for the measurement of (1) Current (2) Voltage [AC (RMS); DC (Average)] (3) Resistance (4) Inductance (5) Capacitance (6) frequency (7) Diode check
2. Use of Single/ Dual trace Oscilloscope for the measurement of (a) Voltage (b) Current (c) time period (d) phase difference (e) Comparing of the two waves in respect of magnitude, phase and frequency.
3. Use digital storage Oscilloscope for the measurement of (a) Voltage current (b) time period (c) Phase difference (d) Comparing of two waves in respect of magnitude, phase and frequency.
4. Use X-Y display unit for (a) comparing two frequencies (b) demonstration of hysteresis loop
5. Measurement of ground resistance by Kelvin's Double Bridge
6. Measurement of inductance by Masewell's Bridge and Comparing of the value by measuring it with Commercial Digital R-C-L bridge and 3% DigitalMultimeter.
7. Measurement of capacitance by wien Bridge and Comparing of the Measurement ofd value from those of commercial Digital R-C-L bridge and 3% Digit Digital Multimeter.
8. Measurement of frequency by Reed type frequency meter and Comparing of the value from the value measured by Digital Frequency meter of 3% Digital Multimeter.
9. Study electronic Power measurement circuit by power integration method.
10. Measurement of (High frequency /RF range) Power by Bolometer.

- **REFERNCE BOOKS**

1. Handbook of measurement Science. Volume I. TheoreticalFundamentals by P.H. Sydenham, John Wiley and Sons, 1982. .
2. Handbook of measurement Science. Volume II. Practical Fundamentals by P.H. Sydenham, John Wiley and Sons, 1983.
3. Handbook of measurement Science. Volume III by P.H. Sydenham,John Wiley and Sons
4. Measurement Systems, Application and Design, by E.O. Deobelin, McGraw-Hill, 1990.
5. Handbook of transducers byH. N. Norton, Prentice Hall.
6. Microsensors Principles and Applications by W. Gardner, John Wiley, 1994.
7. Semiconductor Sensors by S.M. Sze (Ed.), John Wiley and Sons, 1994.
8. Intelligent Instrumentation by George c. Barney , PHI
9. Electronic Instrumentation by H.S. Kalsi, TMH
10. Principles of Industrial Instrumentation by D. Patranabis, TMH

ELECTRICAL MACHINES-II

L	T	P		Curr. Ref. No.: EEE 408	
3	0	2		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:150**	Progressive Assessment:	25
Practical :		30		**Practical**	
Pre Requisite:				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE**

The subject electrical machine-II is a subject, which deals with the ac machines, induction motors, synchronous alternators, fractional horse power motors and three phase transformers. In this subject the construction, working principles, starting principles are to be studied. The testing of the machines and the brief design ideas have also been included here. In addition to the theoretical study of the topics as mentioned above care has been taken for including the practical aspects of the topics. A few problems have been also included here, so that the student can develop the problem solving attitude during their service career.

- **DETAILED COURSE CONTENT:**

UNIT	TOPIC/SUB TOPICS	HOURS
I	**1. Basic Features of A.C. Machines** 1.1. Parts of A.C. Machine & their functions 1.2. Materials used for the various parts 1.3. Stator & rotor winding	5
II	**2. Single Phase Motors** 2.1. To list various type of single phase motors 2.2. To explain the construction & operating principle of various type of inductor motor (split phase type) 2.3. To explain the double revolving field theory. 2.4. To explain double revolving field theory. 2.5. To explain the construction and working principles of single phase commutator motor 2.6. To explain the construction and working principle of shaded pole type single phase induction motor 2.7. To draw the performance characteristics of all above type of single phase motors 2.8. To describe the testing procedure of single phase induction motor and measurement of (1) speed (2) power consumption (3) torque	10
III	**3. Three phase Induction Motor** 3.1. Explain the concept of rotating magnetic field 3.2. Define slip , Synchronous speed (numerical) 3.3. Working of 34) induction motor 3.4. Expression of torque in 34) induction motor	8

	3.5. Torque speed characteristics of 34) induction motor 3.6. Losses in induction motor 3.7. Explain the starting methods of a 3 4) induction motor	
IV	**4. Alternators** 4.1. Types of alternators 4.2. Principle &emf equation 4.3. Winding factors & its effect on induced emf 4.4. Effect of frequency on induced emf 4.5. Effect of speed & excitation on induced emf 4.6. Different excitation systems 4.7. Excitation system used in modern alternators 4.8. Concept of leakage, armature & synchronous reactance 4.9. Principle of working of brushless alternators	10
V	**5. Special Machines** 5.1. Introduction to induction generator 5.2. Introduction to Linear Induction motor 5.3. AC series motor 5.4. Stepper motor 5.5. Brushless DC motor	6
VI	**6. Three Phase Transformers** 6.1. Construction of a typical three phase transformer 6.2. Different types of three phase transformers 6.3. Ratings of transformer 6.4. Power transformers and distribution transformers 6.5. Different types of transformer terminal connection 6.6. Maintenance of transformer	6

- **SPECIFICATION TABLE OF MARKS & HOURS**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	Chapter Title	Hours	K	C	A	Total Marks
1	Basic Features of A.C. Machines	5	2	4	-	6
2	Single Phase Motors	10	3	12	-	15
3	Three phase Induction Motor	8	3	5	7	15
4	Alternators	10	5	10	3	18
5	Special Machines	6	2	6	-	8
6	Three Phase Transformers	6	4	7	2	13
	Total	**45**				**75**

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references.
2. Laboratory manuals

- **PRACTICAL EXPERIENCES**

1. To determine the slip of an induction motor
2. To perform the insulation resistance test of three phase induction motor
3. To perform the no-load test of the three phase induction motor
4. To perform the blocked rotor test of a three phase induction motor
5. To perform the pony brake method of the speed current and speed torque characteristics
6. To determine the effect of rotor resistance on the torque speed curves of an induction motor
7. Determination of Magnetization characteristics of an alternator (a) at no load rated speed (b) at no load half rated speed (c) at full load (non-induction) rated speed
8. Determination of the relationship between terminal voltage and load current of an alternator, keeping excitation and speed constant.
9. Determination of regulation and efficiency of an alternator from open circuit and short circuit.
10. Determination of V-curves of a synchronous machine
11. To study the construction of Three Phase Transformer.
12. To study the construction of Star-delta Starter

- **REFERENCE BOOKS**

S.No.	Title	Author & Publisher
1	Electrical Machines	B L Theraja, Khanna Publishers, New Delhi, 1996
2	Electrical Machines	Bimbhra, P.S.; Khanna Publishers, New Delhi, 1996
3	Elementary ElectricalEngineering	Gupta, M.L., New Heights, New Delhi18th, 1992
4	Basic Electrical Engineering	Mittle, V.N., Tata McGraw-Hill, New Delhi, 1990
5	Transformers	BHEL Bhopal; Tata McGraw-Hill, New Delhi, 1991
6	Transformers Design & Manufacture	Dasgupta, Indrajit; Tata McGraw-Hill, New Delhi, 1995
8	Electrical Machines	Nagrath& Kothari, Tata McGraw-Hill, New Delhi, 1995

ELECTRICAL & ELECTRONICS WORKSHOP PRACTICE

L	T	P		Curr. Ref. No.: EEE 411	
1	0	6		**Theory**	
Total Contact Hours:				End Term Exam:	0
Theory:		10	**Total Marks:50**	Progressive Assessment:	0
Practical :		50		**Practical**	
Pre Requisite:				End Term Exam:	25
Credit:		4		Progressive Assessment:	25

- **RATIONALE**

The role of the subject Electrical and electronics Workshop Practice is very important in building up the career of a technician. It is necessary to learn the concepts, skill, process, technique and develop attitude to work. The concept can be learned in the lecture classes, but for developing skill, learning the process or technique or to develop the attitude to work can be acquired by attending the workshop. In this curriculum case has been taken to include such type of the job which are encountered frequently in the day to day life of an electrical and electronics technician. The jobs are arranged in such a manner that technicians will learn the techniques of solving problems and importance of the IE rules and IS specification.

- **DETAILED COURSE CONTENT:**

UNIT	TOPIC /SUB-TOPIC	HOURS
I	1. To identify different type of tools and accessories used in electrical workshop and prepare a list with diagram. 2. To study the safety practices in electrical workshop 3. To dismantle a ceiling fan using screw driver, wrenches, bearing puller etc. and prepared a list of components 4. To dismantle and assemble single phase and three phase pump motor using screw driver, wrenches, bearing puller etc. and prepared a list of components 5. To perform the preventive maintenance operation of a three phase induction motor along with the servicing of star/delta starter and single phase preventer circuit. 6. To perform the connection of a wiring installation for a) incandescent lamp controlled by a reed switch b) 5 amp, 230V, 3 pin socket controlled by a reed switch c) a ceiling fan controlled from a reed switch through a miniature circuit breaker with neon indicator must be used. 7. To perform the wiring connection of twin fluorescent lamp. 8. To assemble a semi-automatic star-delta starter using contactors and time delay and thermal over load unit. 9. To practice the winding of coils for small transformers and assemble it in stamping of cares finally perform the testing. 10. To perform the megger testing of a wiring installation and fill in the test report form of the electrical supply authorities.	30

	11. To perform the resistance measurement of an earth installation using earth megger testing equipment. 12. To assemble the coils of stator, rotor of an induction motor after using different type of insulating materials and locking wedges. 13. Perform the testing of insulation resistance of the stator and rotor of 3 phase 400V wound rotor induction motor.	
II	1. Identification and use of different tools and accessories used in manufacturing of electronic circuits. 2. Different types of cutters. 3. Nose pliers 4. Wire strippers 5. Screw drivers 6. Lead strengtheners 7. Extractors 8. Soldering iron 9. De-soldering pump 10. Crimping tool 11. Use of regulated power supply. Font panel controls and their functions. 12. Use of DC and AC voltmeter and ammeter to measure DC and AC voltage current. 13. Use of analog multi-meter to measure. 14. AC and DC voltage 15. AC and DC current 16. Different resistor 17. Continuity testing. 18. Use of digital multi meter to measure: 19. AC and DC voltage 20. AC and DC current 21. Different resistor 22. Continuity testing. 23. Use of different switches 24. Toggle switches - SPST, SPDT, DPST, DPDT 25. Thumb-wheel switches 26. Rotary switches 27. Push on/Push off switches 28. Keyboard switches - mechanical, capacitive, membrane 29. DIP switches 30. Use of different display devices 31. LED display 32. Seven segment display 33. LCD display 34. Use of breadboards to implement simple electronic circuits using resistors/ capacitors/diodes/transistors/switches/display devices. 35. Circuit assembly on breadboards and PCBs (rectifiers, oscillators, amplifiers). 36. Assembly of battery eliminator, IC regulator circuits, IC timer, IC operational amplifier circuit. 37. Make a panel for a given circuit.	30

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references.
2. Laboratory manuals

- **SPECIFICATION TABLE OF MARKS & HOURS**

K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit. No.	Chapter Title	Hours	End practical Exam
1	Repairing of home appliances	30	15
2	Different types of tools	30	10
	Total	**60**	**25**

- **REFERENCE BOOKS**

S.No.	Title	Author/ Publisher/Edition/Year
1	**Electrical installation work**	**T.G Francis, ELBS**
2	Printed circuit board: Design & technology	William Bosschart, Tata McGraw Hill, New Delhi, 2nd, 1983
3	Electronic Drafting & Drawing.	Y.I. Shah, JeevandeepPrakashan, Ramdeet, Mumbai, 2nd, 1988
4	Basic Electronics & Linear circuits	Bhargava & Gupta, Tata McGraw Hill; New Delhi, 2nd, 1988
5	Practical Semiconductor Data manuals.	BPB Publications; New Delhi, 1st, 1997
6	Transistor selector data manual	Towers International, BPB Publications; New Delhi, 1st, 1990
7	Laboratory Manual and Teacher Guide in Basic Electronics	TTTI, Bhopal and DTE, Goa,, 1st, 2001
8	Laboratory Manual and Teacher Guide in Digital Electronics	TTTI, Bhopal and DTE, Goa, 1st, 2002

POWER SYSTEM

L	T	P		Curr. Ref. No.: EEE 503	
3	0	0		**Theory**	
Total Contact Hours:				End Term Exam:	75
Theory:		45	**Total Marks:100**	Progressive Assessment:	25
Practical :		0		**Practical**	
Pre Requisite:				End Term Exam:	0
Credit:		4		Progressive Assessment:	0

- **RATIONALE**

The electrical power generation and energy consumption is back bone of every country. The main aim of this subject is to know power generation methods, techniques and economical strategy which methods are suitable on the base of natural resources, technical expertise and economy. This course is intended to enable the student understand the facts, concepts, principles and procedures related to the electric power generation, transmission and distribution. So that students can acquire supervisory skills, which will help him/her to discharge his/her role as a supervisor when he/she starts to work in the industry.

- **DETAILED COURSE CONTENT:**

UNITS	TOPICS/SUB-TOPICS	HOURS
I	**1. Over View Of Sources Of Electrical Energy** 1.1. Hydro power plant 1.2. Steam power plant 1.3. Nuclear power plant 1.4. Wind power plant 1.5. Solar power plant 1.6. Line diagram of power generation, transmission and distribution	5
II	**2. Economics of Generation** **2.1.** Load duration curve **2.2.** Cost of electrical energy **2.3.** Tariff or charge to consumer	2
II	**3. Transmission Line Components & Parameters** **3.1.** Types of electrical transmission systems and their comparison Line components: line conductors, insulators, line supports and supporting structures **3.2.** String insulation and string efficiency **3.3.** Sag in overhead lines **3.4.** Corona **3.5.** Line Resistance, Inductance & Capacitance Skin effect and proximity effect **3.6.** Classification of transmission lines **3.7.** Performance of transmission lines, voltage regulation and efficiency, equivalent circuits	8

	3.8. Ferranti effect	
IV	**4. HVAC & DC Transmission System** 4.1. Operation and control of HVAC transmission system 4.2. Concept of HVDC transmission 4.3. Types of HVDC transmission system 4.4. Comparison between HVAC and HVDC transmission system	6
V	**5. Distribution System** 5.1. Feeders and distributors 5.2. DC distribution system 5.3. AC Distribution system 5.4. The Indian electricity rules	6
VI	**6. Cables** .Overhead and underground cables .Construction of cables Types of cables 6.3. Laying of underground cables	4
VII	**7. Faults and Fault Location in Underground Distribution System** 4.1. Classification of faults 4.2. Causes of faults in underground cables 4.3. Method of Fault location	6
VIII	**8. Construction of Overhead Distribution Lines** 8.1. Erection of supports 8.2. Erection of conductors Repairing and jointing of conductor 8.3. Positioning of conductor and binding with insulator Jumpers, Tee-off 8.4. Earthing 8.5. Guarding	8

- **SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION**

Legends:K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Over view of sources of Electrical Energy	5	3	7	-	10
2	Economics of Generation	2	4	-	2	6
3	Transmission Line Components & Parameters	8	4	4	4	12
4	HVAC & DC Transmission System	6	3	6	-	9
5	Distribution Systems	6	2	6	-	8
6	Cables	4	2	6	2	10
7	Faults and Fault Location in Underground Distribution System	6	2	4	2	8
8	Construction of Overhead Distribution Lines	8	2	6	4	12
	Total	**45**				**75**

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references.

- **REFERENCE BOOKS**

S.No.	Title	Author/Publisher/Edition/Y ear
1	Generation of electrical energy	Gupta B.R.; Eurasia Publishing House, New Delhi, 1998
2	Power system engineering	Nagrath; Tata McGraw-Hill, New Delhi, 1st ,1994
3	High Voltage Engineering	Naidu; Tata McGraw-Hill, New Delhi, 2nd
4	Transmission and Distribution	Raina, K.B. et al; Tata McGraw Hill, New Delhi, 1994
5	A course in electrical power	Soni M.L., Gupta J.L.; DhanpatRai& Sons, New Delhi, latest
6	A text book of electrical power	Uppal S. L.; Khanna publisher, New Delhi, 1996
7	Generation, Distribution &Utilisation of Electrical Energy	Wadhwa, C.L.; Wiley Eastern Ltd., New Delhi, latest

ELECTRICAL DRAWING USING CAD

L	T	P		Curr. Ref. No.: EEE 403	
1	0	4		**Theory**	
Total Contact Hours:				End Term Exam:	0
Theory:		10	**Total Marks:50**	Progressive Assessment:	0
Practical :		50		**Practical**	
Pre Requisite:				End Term Exam:	25
Credit:		3		Progressive Assessment:	25

- **RATIONALE**

Drawing is the language of engineers. Any job which is to be communicated for implementation is required to be done within an optimum time span and with efficacy. Since last century, a lot of change has taken place in electrical engineering drawing for representing job specification. Standardized symbols as prescribed by Bureau of Indian specification are to be introduced while practicing the jobs on drawing. The preparation of list of materials along with the specification writing is also an important factor which is to be dealt in this subject.

- **DETAILED COURSE CONTENT**

UNIT	TOPIC/SUB TOPICS	HOURS
I	**1. Introduction to electrical drawing** 1.1. Need of Electrical Drawing 1.2. Circuit Diagram 1.3. Wiring Diagram 1.4. Block Diagram 1.5. Symbols in Electrical Drawings	**7**
II	**2. Introduction to AutoCAD Electrical** 2.1. Starting AutoCAD Electrical 2.2. Creating a new drawing document 2.3. Title Bar 2.4. Application Menu: New options, Creating Drawings, Creating Sheet Sets 2.5. Open Options: Opening Drawing File, Save, Save As, Export, Publish, Print 2.6. Drawing Tab Bar 2.7. Drawing Area: Command Window, Bottom Bar 2.8. Opening a Project File: New Drawing in a Project, Project Task List, Project Wide Update or Retag 2.9. Drawing List Display Configuration	**10**
III	**3. Electrical Components** 3.1. Inserting Component Using Icon Menu 3.2. Component Tag area 3.3. Installation Code and Location Code 3.4. Pins area	**13**

	3.5. Equipment List 3.6. Panel List 3.7. Wires 3.8. Multiple Bus,Creating of Multiple Buses 3.9. Ladders,Wire Number Leaders and Labels 3.10. Wire Color/Gauge Labels 3.11. Markers 3.12. Circuit Builder, Starting a New drawing 3.13. Editing Title Block 3.14. Creating Wires 3.15. Assigning Numbers and Labels to Wires 3.16. Inserting 3 Phase Motor 3.17. Adding Ground symbol 3.18. Adding symbols for various components	
IV	**4. Editing Wire, Components and Circuits** 4.1. Introduction to Edit Tool 4.2. Internal Jumper 4.3. Delete Component, Copy Component, Edit Circuits drop-down 4.4. Copying Circuit, Moving Circuit, Saving Circuit to Icon Menu 4.5. Transforming Components drop-down 4.6. Aligning Components, Moving Component 4.7. Circuit Clipboard panel 4.8. Editing Wires or Wire Numbers 4.9. Create/Edit Wire Type 4.10. Change/Convert Wire Type	**15**
V	**5. Drawing of Electrical Panel Layout** 5.1. Panel Assembly, Editor, Table Generator, Insert Terminals 5.2. Edit, Copy Codes drop-down, Copy Assembly	**15**

- **SPECIFICATION TABLE OF MARKS & HOURS**

Legends: K=Knowledge level, **C**= Comprehension Level, **A**=Application level

Unit No.	Chapter Title	Hours				Total Marks
			K	C	A	
1	Introduction to Electrical Drawing	7	2	2	-	4
2	Introduction to AutoCAD Electrical	10	4	2	1	7
3	Electrical Components	13	2	2	2	6
4	Editing Wire, Components and Circuits	15	2	2	-	4
5	Drawing of Electrical Panel Layout	15	-	2	2	4
	Total	**60**				**25**

- **LEARNING RESOURCES**

1. Textbooks mentioned in the references.
2. Laboratory manuals

- **RFERENCE BOOKS**

1. AUTOCAD ELECTRICAL 2016 BLACK BOOK, Gaurav Verma and Matt Weber, Published by CADCAMCAE Work

PROFESSIONAL PRACTICES -III

<table>
<tr><td>L</td><td>T</td><td>P</td><td rowspan="7">Total Marks:150</td><td colspan="2">Curr. Ref. No.: EEE 511</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td colspan="2">Theory</td></tr>
<tr><td colspan="3">Total Contact Hours:</td><td>End Term Exam:</td><td>0</td></tr>
<tr><td colspan="2">Theory:</td><td>0</td><td>Progressive Assessment:</td><td>0</td></tr>
<tr><td colspan="2">Practical :</td><td>30</td><td colspan="2">Practical</td></tr>
<tr><td colspan="3">Pre Requisite:</td><td>End Term Exam:</td><td>0</td></tr>
<tr><td colspan="2">Credit:</td><td>1</td><td>Progressive Assessment:</td><td>50</td></tr>
</table>

- **RATIONAL:**

  To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

AIM

Student will be able to:

Acquire information from different sources
Prepare notes for given topic
Present given topic in a seminar
Interact with peers to share thoughts
Prepare a report on industrial visit, expert lecture

- **CONTENTS**

Activities

- **Industrial Visits**

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries: Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant.

i. Machine shop having CNC machines.
ii. ST workshop / Auto service station
iii. City water supply pumping station
iv. Manufacturing unit to observe finishing and super finishing processes.

Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas:
Interview Techniques.
Modern Boilers - Provisions in IBR
Applications of Sensors and Transducers
Alternate fuels - CNG / LPG , Biodiesel, Ethanol, hydrogen
Piping technology

- **Information Search:**

Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report **any one** topic.
Following topics are suggested:

i. Engine lubricants & additives
ii. Automotive gaskets and sealants
iii. Engine coolants and additives
iv. Two and Four wheeler carburetor.
v. Power steering
vi. Filters
vii. Different drives/Transmission systems in two wheelers.
viii. Types of bearings - applications and suppliers
ix. Heat Exchangers
x. Maintenance procedure for solar equipment.

Tools holder on general purpose machines and drilling machines.

- **Seminar:**

Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes)
Mini Project / Activities: (any one)

a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as : i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Cams and Followers v) Geneva mechanism
b) Dismantling of assembly (e.g. jig / fixtures, tool post, valves etc.) Take measurement and prepare drawings / sketches of different parts.
c) Make a small decorative water fountain unit
d) Toy making with simple operating mechanisms.