PART — III

1st Semester

FINAL DRAFT FOR

CURRICULAR STRUCTURE

AND SYLLABI OF

FULL-TIME DIPLOMA COURSES IN

ENGINEERING & TECHNOLOGY

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

- **Sri Ashim Kumar Manna Mobile:8902701784**
- **Sri Swarup Kar Mobile:9433689007**
- **Sri Pinaki Ranjan Paul Mobile:9433130215**
- **Sri Anup Sarkar Mobile:9433521132**
- **Sri Swarup Kayal Mobile:9433164470**

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME: FULL TIME DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING

DURATION OF COURSE: 6 SEMESTERS

SEMESTER: FIFTH

BRANCH: ELECTRICAL & ELECTRONICS ENGINEERING

SR. NO.	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR	@TW	Total Marks
						TA	CT	Total				
1.	**Industrial Electronics-I**	**3**	**3**		**-**	**10**	**20**	**30**	**70**	**-**	**-**	**100**
2.	**Transmission & Distribution of Power**	**3**	**3**	**-**	**-**	**10**	**20**	**30**	**70**	**-**	**-**	**100**
3.	**Switchgear & Protection**	**3**	**3**			**10**	**20**	**30**	**70**			**100**
4.	**Microprocessor & Microcontroller**	**3**	**3**	**-**	**-**	**10**	**20**	**30**	**70**	**-**	**-**	**100**
5.	**Elective-I (Select any one)** **i) Illumination Engineering** **ii)Heating, Ventilation and Air conditioning** **iii) Electric Traction** **iv) Computer Hardware Maintenance**	**3**	**3**	**-**	**-**	**10**	**20**	**30**	**70**	**-**	**-**	**100**
6.	**Industrial Electronics-I Laboratory**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**50**	**-**	**50**
7.	**Transmission & Distribution of Power Laboratory**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**50**	**-**	**50**
8.	**Switchgear & Protection Laboratory**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**50**	**-**	**50**
9.	**Microprocessor & Microcontroller Lab**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**50**	**-**	**50**
10.	**Elective- I Laboratory**	**1**	**-**	**-**	**2**	**-**	**-**		**-**	**50**	**-**	**50**
11.	**Professional Practice -III**	**2**			**3**					**50**		**50**
12.	**Industrial Project & Entrepreneurship Development**	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**50**	**50**
	Total	**24**	**16**	**1**	**15**	**50**	**100**	**150**	**350**	**300**	**50**	**850**

STUDENT CONTACT HOURS PER WEEK:32 hrs, (Teaching-15 weeks + Internal Exam-2 weeks)

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH

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

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

Total Marks : 850

Minimum passing for Sessional marks is 50%, and for theory subject 50%.

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

Name of the course: **Industrial Electronics –I**

Course Code: EEE/ IE1 /S5	Semester: Fifth
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 3 contact hrs./ week	Class Test (Internal Examination): 20 Marks
	Teacher's Assessment (Attendance, Assignment & interaction):10 Marks
Practical: 2 contact hours/ week	End Semester Examination: 70 Marks
Credit: 4 (Four)	Practical: 50 Marks
Rationale:	

Objectives:

The student will be able to:

This course is introduced to have the students become familiar with the high power electronic devices and components like power diode, IGBT, power transistor, SCR.

	Content (Name of topic)	**Periods**	**Marks**
	Group-A		
Unit 1	**Power diode**	4	
	1.1 Switching characteristics of power diodes and its specifications. 1.2 Characteristics of fast recovery diodes. 1.3 Choice of diodes depending upon frequency of operations. 1.4 Series and parallel operations of diodes. 1.5 Thermal characteristics		
Unit 2	**Power Transistor**	6	
	2.1 Power BJT : Structure of vertical power transistor, Principle of operation, its VI and switching characteristics, Safe operating area. 2.2 Base drive circuits and Darlington configuration of Power BJT. 2.3 Construction operating principle and switching characteristics of power MOSFET and IGBT. 2.4 Study of Losses in power semiconductor devices- calculation of loss in power BJT		
Unit 3	**Mounting, Cooling and Protection of Power Semiconductor Devices**	4	
	3.1 Concept of thermal resistance, heat sink and thermal equivalent circuit 3.2 Describe different mounting techniques of power semiconductor devices 3.3 Concept of protection of Power Semiconductor Devices: Transient protection, MOV and Snubber		
	Group – B		
Unit 4	**Thyristor**	5	
	4.1 Switching characteristics & Two transistors method of SCR, Ratings of SCR. 4.2 Triggering circuits of SCR. 4.3 Need for series and parallel methods of SCR. Reasons of unequal voltage and current 4.4 distribution and equalization networks. 4.5 Layer diagram, Characteristics, operating principle and application of thyristor 4.6 family devices - Photo sensitive SCR, GTO, SCS, TRIAC & DIAC.		

	4.7 Commutation circuits of SCR – natural and forced commutation – class A, B, C, D And Class E		
UNIT 5	**SINGLE PHASE & POLYPHASE CONTROLLED RECTIFIER**	7	
	5.1 Single phase half wave and full wave control rectifier circuit – Principle of operation with resistive and inductive load – Use of free wheel diode. 5.2 Three phase half wave and full wave control rectifier – Operation with inductive and resistive load – Use of free wheel diode. 5.3 Calculation of Vdc, Vrms, ripple factor, PIV and efficiency of single phase & three phase control rectifier. 5.4 Concept of full control and half control rectifier.		
UNIT 6	**SWITCH MODE POWER SUPPLY**	6	
	6.1 Switching Regulator (SMPS) principle of operation, Block and circuit diagram and PWM control circuit consideration of switching regulator. 6.2 Principle of operation of buck converter, boost converter and buck-boost CONVERTER. 6.3 Review of Linear Regulators. 6.4 Advantage and disadvantage of switching regulator in comparison with linear regulator		
	TOTAL	32	

Contents Practical

Skills to be developed: On satisfactory completion of the course, the students should be in a position to design few fundamental networks.

Intellectual Skills:

1) Able to select proper instruments
2) Compare the characteristics under various conditions

Motor Skill:

1) Make accurate measurements
2) Adjust the meters to read zero at start
3) Draw graphs

List of Practical: Any EIGHT(including MINI PROJECT)

Suggested List of Laboratory Experiments

Sl. No.	
1.	To measure the reverse recovery time of switching diode and power BJT.
2.	To study drive circuits of power BJT.
3.	To plot V/I characteristics of Triac.
4.	To plot V/I characteristics of Diac
5.	To study drive circuit of SCR.
6.	To study a single phase rectifier—output waveform with phase control circuit.
7.	To study a polyphase rectifier
8.	To study the speed control of DC motor by**:** —
	(a) varying field current keeping armature voltage constant; and,
	(b) varying armature voltage keeping field current constant.
9.	To study SMPS with PWM regulator chip

10.	**Mini Project**
	Liquid level detector
	Develop light dimmer circuit using diac and Triac.

Examination scheme (Theoretical):

A). Internal Examination: Marks- 20

B). End Semester Examination: Marks-70

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

(i) Marks on Attendance

(ii) Assignments & Interaction

Group	**Unit**	**Objective questions** **Note: 10 multiple choice and 5 short answer type questions**			**Total Marks**
		To be set short answer type	To be answered	Marks per question	
A	1,2,3	12	Any Twenty	1	20x1=20
B	4,5, 6	11			

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

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

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

Sl. No.	**Name of the Author**	**Title of the Book**	**Name of the Publisher**
1.	Biswanath Pal	Industrial Electronics	PHI
2.	Moorthi	Power Electronics	OXFORD
3.	Khan & Chandani	Industrial Electronics	TMH
4.	SN Biswas	Industrial Electronics	Dhanpat Rai
5.	PC Sen	Modern Power Electronics	S Chand
6.	Chatterjee & Bhattacharya (TTTI)	Industrial Electronics	TMH
7.	Mohan	Power Electronics Converter Application and Design	Wiley
10.	M.C Sharama	Practical SCR / Triac projects	
11.	F. Graf	The Encyclopaedia of electronic circuit by Rudolf	

Name of the course: **Transmission and Distribution of Power**	
Course Code: EEE/TDP/S5	Semester: FIFTH
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100+50
Teaching Scheme	**Examination Scheme**
Theory: 3 Hrs./Week	Class Test (Internal Examination): 20 Marks

Tutorial: nil	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
Practical :2 Hrs./Week	End Semester Examination: 70 Marks
Credit: 04	Practical: 50 Marks

Aim:

Sl. No.	
1.	Electrical diploma pass outs should know systems for electrical energy transmission & distribution. They also will be able to identify various components & their functions.
2.	They will be able to measure system performance. They will be able to deal with various aspects of transmission and distribution system at different stages including erection and maintenance. Hence he should be well acquainted with the materials required and the methods employed for erection and maintenance.
3.	On completion the study of transmission & distribution, he/she will be able to work as technician/supervisor in power industry, manufacturing industry & public utilities.

Objective:

Sl. No.	The student will be able to:
1.	Interpret various types of transmission & distribution systems.
2.	Identify various components & Know their functions.
3.	Calculate voltage regulation & efficiency of transmission system.
4.	Calculate voltage drop of distribution system.

Pre-Requisite:

Sl. No.	
1.	Basic Electrical Engineering.
2.	Electrical Power Generation.

	Contents (Theory)	Hrs./Unit	Marks
Unit: 1	Basics Of Transmission: 1.1Necessity & functions of protective system. 1.2 Concept of Primary & Secondary transmission & distribution. 1.3 Advantages and limitations of using high voltage for power transmission. 1.4 Comparison between AC & DC power transmission systems. 1.5 Kelvin's laws for the economic choice of conductor size – related problem.	04	04
Unit: 2	Transmission Line Components: 2.1 Main components of Overhead lines (names & functions only). 2.2 Types of conductors-Copper, Aluminum & state their trade names. 2.3 Solid, Stranded & bundled conductors. 2.4 types of supports – RCC/PCC poles, steel tower 2.5 Comparison between single circuit and double circuit design 2.6 conception of ground wire. 2.7 Line insulators – requirements, types, and field of applications.	12	16

	2.8 failure of insulators, creepage distance (definition & significance only) 2.9 Distribution of potential over a string of three suspension insulators. --- Problems. 2.10 Concept of string efficiency, Methods of improving string efficiency. ---- Problems. 2.11 Corona – corona formation, advantages & disadvantages, factors affecting corona, important terms related to corona. 2.12 Calculation of Span length & sag Calculation , effect of wind pressure, temperature and ice deposition----- Problems. 2.13 Stringing chart and its uses. 2.14 Spacing of conductors, length of span, Relevant I.E. Rules.		
Unit: 3	Transmission Line Parameters: 3.1 R,L & C of 1-ph & 3-ph transmission line & their effects on line.(No deduction and Problems) 3.2 Skin effect, proximity effect & Ferranti effect. 3.3 Concept of transposition of conductors & necessity.	03	03
Unit: 4	Underground Cables: 4.1 Classification of cables and Comparison with overhead lines. 4.2 Cable construction. 4.3 Description of (i) PVC, (ii) PILC (iii) FRLS (Fire Retardant Low Smoke), (iv) XLPE cables & (v) Gas filled (SF6) cables 4.4 Cable Rating and De-rating factor. 4.5 Cable laying	04	07
Unit:5	Performance Of Transmission Line: 5.1 Classification of transmission lines. 5.2 Losses, Efficiency & Regulation of line. 5.3 Performance of single phase short transmission line(Numerical based on it) 5.4 Effect of load power factor on performance. Power Factor Improvement Using Static condenser and Synchronous condenser – related problems. 5.5 Medium transmission lines-End condenser, Nominal T & Nominal Pi Network with vector diagram.---- no problem.	09	15
Unit:6	Extra High Voltage Transmission: 6.1 EHVAC Transmission, Reasons for adoption & limitations. 6.2 Regional Grid System (Conception only). 6.3 Concept about FACTS and its applications. 6.4 HVDC Transmission – Advantages, Limitations. 6.5 Discussion on few HVDC system in Indian scenario.	03	05
Unit:7	Components of Distribution System: 7.1 Introduction. 7.2 Classification of distribution system. 7.3 A.C distribution. 7.4 Connection schemes of distribution system.	08	12

	7.5 Requirements of Distribution systems. 7.6 Design consideration. 7.7 A.C. distribution calculations. 7.8 Methods of solving A.C.-1 phase & 3 Ø –phase connection (balanced) distribution system. (Numericals based on 1-ph & 3-ph balanced distribution system)		
Unit:8	**Substations:** 8.1 Introduction. 8.2 Classification of indoor & outdoor sub-stations. 8.3 Advantages & Disadvantages. 8.4 Selection & location of site. 8.5 Main connection schemes. 8.6 Equipments and circuit element of substations – their symbols & function. 8.6.1 Bus bar's material, types in detail. 8.6.2 Connection diagram and layout of sub-stations with proper notation.	05	08
Total		**48**	**70**

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: 1.1 Identification & selection of components. 1.2 Making proper connections
2.	Motor Skills: 2.1 Ability to measure various parameters. 2.2 Ability to follow standard test procedures.
3.	LIST OF EXPERIMENTS : (At least Eight Experiments are to be performed) 3.1 To demonstrate the improvement of P.f. using static condenser. 3.2 To demonstrate various system faults by D.C. network analyzer. 3.3 To study active and reactive power flow through transmission lines. 3.4 To study the supply system of 6.6 KV/400V sub-station to a housing complex using slides/model. 3.5 To study various types of turbine used in Power station using slides/models. 3.6 To study different types of excitation system for alternator using slides/models. 3.7 To study different kinds of insulators (Insulators are required to be available in laboratory) 3.8 To study PILC, PVC, FRLS and XLPE cables. (Cables are required to be available in laboratory) 3.9 To measure Solar Radiation with the help of Pyranometer. 3.10 To demonstrate the photo voltaic system used in street lighting – PV module, CCU, Battery, CFL. 3.11 To study power generation by wind power – using model / slides.

Text Books:

Name of Authors	Title of the book	Edition	Name of the Publisher
V. K. Mehta & R. Mehta	Principles of power system		S. Chand & Company
SoniGupta-Bhatnagar	A Course in electrical power		Dhanpat Rai
J. B. Gupta	Transmission & distribution		S.K. Kataria & Sons.

	of electrical energy		
Nagsarkar & Sukhija	Power System Analysis		Oxford University Press
H Kailasaraman	Handbook of Power and Distribution Transformer Services		Universities Press
Dr. K.Uma Rao	Power System Operation and Control		Wiley-India
A. T. Starr	Generation, Transmission and Utilization of Electric Power		Pitman
Gorti Ramamurthy	Handbook of Electric Power Distribution		Universities Press
C.L.Wadhwa.	Electrical Power System		Wiley Eastern Ltd

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	*TO BE ANSWERED*	MARKS PER QUESTION	TOTAL MARKS
A	1, 2,3,4	8	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE taking at least THREE from each Group	TEN	10 X 5 = 50
B	5,6,7,8	12				FIVE			

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

EXAMINATION SCHEME (SESSIONAL)

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

Name of the course:: Switchgear and Protection	
Course Code: EEE/SWGRP /S5	Semester: FIFTH
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100+50
Teaching Scheme	**Examination Scheme**
Theory: 3 Hrs./Week	Class Test (Internal Examination): 20 Marks
Tutorial: nil	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
Practical :2 Hrs./Week	End Semester Examination: 70 Marks
Credit: 04	Practical: 50 Marks

Aim:

Sl. No.	
1.	To study the principles, concepts & procedural aspects of switchgear & protection.
2.	To Identify various components of switchgear & protection systems.
3.	To Identify faults & know how to repair the switchgear.

Objective:

Sl. No.	The student will be able to:
1.	Explain the principles, concepts & procedural aspects of switchgear & protection.
2.	Identify the various components of switchgear & protection systems.
3.	Select switchgear & protection system as per specification

Pre-Requisite:

Sl. No.	
1.	Power system
2.	Fundamentals of AC, DC Machines

	Contents (Theory)	Hrs./Unit	Marks
Unit: 1	**Fundamental:** 1.1Necessity & functions of protective system. 1.2 Normal & abnormal conditions. 1.3 Types of faults & their causes. 1.4Use of current limiting reactors & their arrangements. 1.5 Short-circuit KVA calculations for symmetrical faults – problems.	06	10
Unit: 2	**Circuit interrupting devices:** 2.1 Basic fuse terminology: fuse element, rated current, fusing current, fusing factor, prospective current, cut-off current, arcing time, rupturing capacity, total operating time. Fuse Characteristics 2.1.1 HRC fuses – construction, types, working, characteristics, selection and applications	11	18

	2.2 Isolators- vertical break, horizontal break & pentograph type 2.3 Arc formation process, methods of arc extinction, related terms. 2.4 Circuit breakers- Concept, Classification, Working principle, Construction, Specification & Applications of 2.4.1 E.H.V/H.V – Minimum oil circuit breakers (M.O.C.B.), Air Blast Circuit Breaker (A.B.C.B),Sulpher Hexa Fluoride circuit breaker (SF6). vacuum circuit breaker. 2.4.2 L.V.- Air circuit breakers (ACB),miniature circuit breakers (M C B) , Moulded case circuit breakers (M C C B) , Earth leakage circuit breaker (E L C B or R C CB), Comparison of fuse & MCCB 2.5 Selection of MCCB for motor. 2.6 Selection and rating of circuit breakers - breaking capacity, making capacity, rated operating duty, rated voltage. 2.7 Elementary idea of Auto-reclosing.		
Unit: 3	**Protective Relaying:** 3.1 Zones of protection, primary & back-up protection, Essential qualities of protection, classification of protective schemes, basic relay terminology. 3.2 CT & PT used in protection: Requirements, Basic circuit diagram, working principle & application of CVT and CCVT. 3.3 Operating principles and construction (in brief) of: Electromagnetic relays, thermal relays, static relays (with merits and demerits), and Microprocessor based relays, Auxiliary switch Flags – conception only. 3.4 **Over current relay---** Time-current characteristics of definite time, instantaneous, inverse time and IDMT Relays. Use of very inverse-type O/C relay and extremely inverse type O/C relay. Time-setting, current-setting, PSM – problems. 3.5 **Directional Relay** - Introduction, Characteristics: Constant product characteristics, Polar characteristics, Concept of dead zone. 3.6 **Distance Protection Scheme:** Area of applications, Impedance relays, Reactance relay, MHO relay : operating characteristics, effect of arc resistance on their characteristics. 3.7 **Differential Relay** : Introduction, Current differential	15	18

	protection for an internal fault – fed from single & both end. Voltage balance differential protection – Schematic diagram & operation (in brief). Mention the position of operating coil and the restraining coil for both the cases. 3.**8 Static over current relays** **3.9 µP based over current relays.**		
Unit: 4	**Equipment Protection:** 4.1 **Generator protection** – Percentage differential stator protection, brief idea of: - rotor protection due to loss of excitation, protection against rotor overheating because of unbalance in load, over-speed protection, protection against motoring and field suppression. 4.2 **Transformer protection** - Percentage differential protection – problems, Buchholz Relay, rate of rise of pressure relay, over-fluxing protection, O/C protection. 4.3 **Protection of Motor:** Abnormalities & faults. Short circuit protection, Overload protection, Single phase preventer. 4.4 **Protection of Busbar & transmission line**	11	16
Unit:5	**Over voltage Protection:** 5.1 Causes of over voltages. 5.2 Lighting phenomena & over voltage due to lightning. 5.3 Protection of transmission line & substation from direct stroke. 5.4 Types of lightning arresters & surge absorbers & their Construction & principle of operation. 5.5 Protection against traveling waves. 5.6 Insulation co-ordination.	05	8
Total		**48**	**70**

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: 1. Identify different types of circuit breakers 2. Test the different types of relays. 3. Idea about simulation.
2.	Motor Skills: 1. Simulate circuit configuration.

	2. Set the relays for various tests.
3.	**List of Practical: (3.1 and 3.2 are compulsory & any Five from the rest)** 3.1 To demonstrate HRC fuse, MCB & ELCB and explain the functions of various components. 3.2 To Identify the components of following types of circuit breakers with their specifications (through visits , video or model).: I) Low tension air circuit breaker.(including protective devices) II) Minimum oil circuit breaker (M O C B) III) Air Blast circuit breaker (ABCB) IV) Sulpher - Hexa fluoride circuit breaker (S F 6) V) Vacuum circuit breaker. 3.3 To Plot the inverse characteristics of Induction type/ Micrprocessor Based – (i) O/C relay, (ii) E/F relay using Relay Testing Kit. 3.4 To test percentage Differential Protection of Transformer Using Transformer Differential Relay (Electromagnetic/Microprocessor based). 3.5 To demonstrate the operation of single phasing preventer by creating single phasing fault for a given 3-ph induction motor with D.O.L. starter. 3.6 To test Directional Over Current Relay (DOCR) by Relay Testing Kit. 3.7 To simulate Alternator Protection using any simulator 3.8 To simulate the operation of Distance Relay using any simulator 3.9 To prepare a report on specifications of lightning arresters of different manufacturers through Brochures / Literature

Text Books:

Name of Authors	Title of the book	Edition	Name of the Publisher
J.B.Gupta	Switchgear & Protection		S.K.Katharia & Sons
C.L.Wadhwa	Electrical Power System		Wiley Eastern Ltd.
Badriram & Vishwakarma P.N.	Power System Protection & Switchgear		TMH, New Delhi
B. Bhalja, R.P.Maheshwari & N.G. Chothani	Protection and Switchgear		Oxford University Press
V.K. Mehta & R. Mehta	Principles of Power system		S.Chand & Co. Ltd.
B. Ravindranath, M Chandar	Power System Protection and Switchgear		Wiley Eastern Ltd.
Raghuraman	Protection & Switchgear		Scitech Publication (India) Pvt. Ltd.

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

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

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

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

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

Name of the course: **Microprocessor and Microcontroller**	
Course Code: EEE/ MPMC/S5	Semester: Fifth
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 3 contact hrs./ week	Class Test (Internal Examination): 20 Marks
	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
Practical: 2 contact hours/ week	End Semester Examination: 70 Marks
Credit: 3+1	Practical: 75 Marks
Aim:	
1. Today microprocessors and microcontrollers have become an integral part of all automatic and semi automatic machines. Therefore there is a growing need of engineers / technicians in this field. Hence, it is necessary to study microcontroller basics, hardware and its programming. 2. This subject covers microprocessor 8085 and microcontroller 8051 architecture, its instruction set, programming and applications. After completing this subject the student can write and	

execute programs for microcontroller and microprocessor based applications.

Objectives:

1. Describe architecture and operation of microprocessor 8085
2. Develop assembly language programs using instruction set of 8085
3. Describe architecture and operation of microcontroller 8051
4. Develop assembly language programs using instruction set of 8051
5. Design and develop microcontroller based systems
6. Explain various applications of microcontrollers

Pre-Requisite: Knowledge of digital electronics

	Content (Name of topic)	Periods	Marks
	Group-A		
Unit 1	**Microprocessor Basics**	8	12
	1.1 Generation and evolution of 4 bit microprocessor to latest microprocessor 1.2 Basic Architecture of 8-bit Microprocessor 1.2.1 Hardware features of Intel – 8085 functional Blocks, bus structure. 1.2.2 Arithmetic Logic Unit 1.2.3 Registers (General purpose & Special Purpose) 1.2.4 Interrupts 1.2.5 Pin description. 1.3 Timing cycles of 8085 – Machine cycle, Opcode fetch cycle, execution cycle, instruction cycle.		
Unit 2	**Microprocessor Programming**	8	13
	2.1 Instruction set of Intel 8085 2.2 Addressing modes 2.3 Introducing to branch and subroutine 2.4 Simple Program such as Addition, Subtraction, Multi-byte addition, Multiplication of two numbers, BCD to Hex conversion, Hex to BCD conversion etc. 2.5 Interrupt & Interrupt Service Routine		
Unit 3	**Application of microprocessor**	8	10
	3.1 Review of A/D and D/A converter 3.2 Interfacing – parallel (8255) 3.3 Measurement of voltage, current, frequency. 3.4 Generation of square, triangular and staircase waveform. 3.5 Over current Relay operation . 3.6 Speed control of D.C. motor		
	Group B		
Unit 4	**Microcontroller Basics**	7	10
	4.1 Introduction and applications 4.2 Comparison between microcontrollers and microprocessors 4.3 Evolution of microcontrollers		

	4.4 Architecture of 8051 4.4.1 Block diagram of 8051 microcontroller 4.4.2 Registers in 8051 4.4.3 General purpose or working registers 4.4.4 Stack Pointer and Program counter 4.4.5 Special function registers (SFR) 4.4.6 Program Status word 4.4.7 Data pointer (DPTR) 4.4.8 Timer resisters 4.4.9 Ports 4.4.10 Control registers		
Unit 5	**8051 addressing modes and instructions**	6	10
	5.1 8051 addressing modes 5.2 8051 instruction set 5.5 8051 Simple Program such as Addition, Subtraction, Multi-byte addition, Multiplication of two numbers, BCD to Hex conversion, Hex to BCD conversion, Hex to ASCII conversion etc.		
Unit 6	**8051 interrupts, timer/counters**	6	7
	6.1 Interrupts in 8051 6.2 Initializing 8051 interrupts 6.3 Interrupt priorities 5.1 6.4 Timers and counters, timer counter modes		
Unit 7	**Application of microcontroller**	5	8
	7.1 Measurement of voltage, current, frequency. 7.2 Generation of square, triangular and staircase waveform. 7.3 Over current Relay operation . 7.4 Speed control of D.C. motor.		
	TOTAL	48	70

Contents Practical

Suggested List of Laboratory Experiments

Sl. No.	
1.	Introduction of 8085 Microprocessor and 8051Microcontroller Kit
2.	To develop and execute the following using 8085 Microprocessor / 8051 Microcontroller **(At least Eight programs)**
	i) Addition, Subtraction of two numbers. ii) Multi-byte addition. iii) Multiplication of two numbers. iv) Finding the maximum value in an array. v) Arranging the given data in Ascending order. vi) BCD to Hex conversion. vii) Hex to BCD conversion. viii) Hex to ASCII conversion. ix) ASCII to Binary conversion. x) Square Root of a given data. xi) Least Common Multiple of two numbers. xii) Greatest Common Divisor of two numbers.
	To develop, Run & Test Program for the following using 8085 Microprocessor / 8051

	microcontroller: **(At least Four applications)**
	1. Measurement of dc voltage and currents using suitable potential divider circuit and shunt along with an A/D converter. 2. Measurement of ac voltage, current, frequency and phase angle difference (either between two voltages or between voltage and current) using suitable PT, CT, Zero crossing detectors, A/D converters etc. 3. Generation of square, triangular, staircase wave form using D/A converter. 4. Over voltage/under voltage or over current/under current relay circuit using suitable hardware circuit. 5. Control of a D.C. motor at different speed and to note speed vs. Load characteristics at open loop condition. 6. Operation of a stepper motor with a fixed number of steps and to determine the angular displacement per step by measuring the total angular rotation. 7. Operation of a stepper motor continuously at different speed. 8. Control of Traffic light.

EXAMINATION SCHEME (THEORITICAL)

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

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

EXAMINATION SCHEME (SESSIONAL)

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

Sl. No.	Name of the Author	Title of the Book	Name of the Publisher
1.	Ramesh Gaonkar	Microprocessor Architecture, Programming, and Applications with the 8085	Wiley Eastern Ltd.
2.	B. Ram	Fundamentals of Microprocessor & Microcontroller	Danpat Rai Publication
3.	Senthil Kumar	Microprocessor & Microcontroller	OXFORD
4.	Shibu KV	Embedded	Tata Mc Graw Hill
5.	Krishna Kant	Microprocessors & Microcontrollers	PHI
6.	Rajkamal	Microcontroller	Pearson
7.	Mazidi	The 8051 Microcontroller and Embedded Systems Using Assembly and C	Pearson
8.	Avilash V. pandiahkal	A Key to programme Microcontroller system	S Chand
9.	Shah	Microcontroller	OXFORD
10.	Dr. SK Mandal	Microprocessor & Microcontroller	TMH
11.	Ayala	Microcontroller 8051	
12.	Ghosal	8051 Microcontroller : Internals, Instructions, Programming & Interfacing,	Pearson
13.	Subhasis maitra	Micrprocessor and Microcontroller	JBBL

\

Name of the course : Illumination Engineering (Elective)	
Course Code : EEE/ILE (EL)/S5	Semester : Fifth
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks : 100+50
Teaching scheme :	Examination Scheme
Theory: 3 Hrs./ Week	Class Test (Internal Examination): 20 Marks
Practical: 2 Hrs./ Week	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
	End Semester Examination: 70 Marks
	Practical: 50 Marks
Credit:	

Aim:	
Sl. No.	
1.	To measure the level of illumination.

2.	To study various types of lamps.
3.	To design illumination schemes for various applications in residential, commercial & industrial locations.
Objective:	
Sl. No.	Student will be able to:
1.	Measure the level of illumination.
2.	Differentiate between various types of lamps.
3.	Identify & list of various lighting accessories and components.
4.	Design a control circuit for illumination.
5.	Design and execute illumination schemes for various applications in Residential, Commercial & Industrial locations.
Pre-Requisite:	
1.	Knowledge of Optics and light sources.
2.	Wiring, switching and control circuits.

	Contents (Theory):	Hrs./Unit	Marks
Unit : 1	**1. Fundamentals of Light :** 1.1 Electromagnetic radiation & Light. 1.2 Electromagnetic spectrum – Ultraviolet, Visible, Infrared spectrum. 1.3 Human eye as an optical system – basic concept. 1.4 Spectral sensitivity of human eye – Photopic, Scotopic, Mesopic vision. 1.5 Visual characteristics – Brightness, Contrast, Glare, Flicker. 1.6 Visual performance - Visibility level, Contrast rendering factor. 1.7 Colorimetry – Visual basis, Source colour, Object colour. 1.8 Colorimetric instrument – Colorimetry of light source and materials, Colour rendering index.	**07**	**10**
Unit : 2	**2. Measurements:** 2.1 Photometry – Basic concept, Fundamentals of detector. 2.2 Photometric measurements – Methods to measure Luminous intensity, Luminous flux, Luminance, Illuminance. 2.3 Application of Polar Photometer & Goniophotometer. 2.4 Luxmeter – Working principle & Application. 2.5 CIE standard source of illuminant. 2.6 Radiation of energy – Black body radiation, Full radiator, Thermal radiation, Radiation from incandescent lamps.	**07**	**12**
Unit : 3	**3. Lamps & Accessories :** 3.1 Lamp materials – glass, filament, phosphor coating, ceramics, electrodes, gases, capping cement etc. 3.2 Theory & basic properties of low & high pressure gas discharge.	**10**	**12**

	3.3 Theory of operation, Life, Characteristics and Application of - a) High & Low pressure sodium vapour. b) High & Low pressure mercury vapour. c) Metal halide. d) Fluorescent lamp. e) LED. f) LASER. 3.4 Optical fiber – its construction as light guide, characteristics, application in lighting. 3.5 Luminaire – Types of luminaire, Design consideration, Indian standard recommendation.		
Unit : 4	**4. Illumination Control & Control circuits :** 4.1 Purpose of lighting control – Energy conservation. 4.2 Electromagnetic & Electronic ballast – Operation & comparison in light control. 4.3 Ignitor – its function in lamps. 4.4 Control circuits & operation of – a) Fluorescent lamp circuit. b) Low pressure sodium vapour lamp circuit. c) High pressure sodium vapour lamp circuit.	**08**	**12**
Unit : 5	**5. Interior Lighting :** 5.1 National standards of interior lighting calculation. 5.2 Lighting calculations of interior lighting. (Numerical) 5.3 Design considerations for interior lighting of - (a) Residential complex. (b) Commercial complex. (c) Industrial premises. 5.4 Design with Lighting design software. 5.5 Daylighting – Sky luminance pattern, Daylight factor, estimation of average daylight factor, window design considerations for maximum daylighting, Application of daylight in interior lighting. 5.6 Use of photocell, occupancy sensor in lighting controls. 5.7 Concept of Isolux contour in lighting design.	**10**	**12**
Unit : 6	**6. Exterior Lighting :** 6.1 Lighting calculations of exterior lighting. (Numerical) 6.2 Calculation of lighting & design considerations for exterior lighting of - (a) Road lighting. (b) Flood lighting – Industrial complex, Commercial complex, Sports complex. 6.3 National & CIE standards of exterior lighting calculation.	**06**	**12**
	Total	**48**	**70**
Practical:			

Skills to be developed:
Intellectual Skills:
1. To select appropriate equipment.
2. Apply different lighting designing skills.
Motor Skills:
1. Ability to draw the circuit diagrams.
2. Ability to measure illuminance properly.
List of practical: (At least Eight Experiments are to be performed)
1. To measure illuminance (daylight & artificial light) at different points of a classroom by Luxmeter & draw – (i) Variation of Illuminance characteristics with distance and (ii) Isolux plot.
2. To study the technical data of different types of lamps available in the market & draw their connection diagram.
3. To study the different lighting accessories, ignitor & electronic ballasts required for different types of lamps – Sodium vapour, Mercury vapour, Metal halide, CFL, Fluorescent lamp.
4. To study the different luminaries available in the market for various types of lamps with their technical specifications, their design consideration, Indian standard recommendation.
5. To study of – (i) Photocell, (ii) Occupancy sensor in artificial lighting control.
6. To design an illumination scheme of a conference hall of medium size.
7. To design an illumination scheme for a workshop in your institute.
8. To design an illumination scheme for a playground of medium size.
9. To design an illumination scheme for a shopping complex of medium size.
10. To visit a standard lamp manufacturing industry and make a report on lamp manufacturing process.
11. A case study of optimum lighting design with lighting design software.
List of Text Books:

Sl. No.	Name of Author	Title of the Books	Name of Publisher
1.	Jack L. Lindsey	Applied Illumination Engineering	The Fairmont Press Inc.
2.	R.H. Simons, Robert Bean	Light Engineering : Applied calculations	Architectural Press
3.	Casimer M Decusatis	Handbook of Applied Photometry	Springer

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	*TO BE ANSWERED*	MARKS PER QUESTION	TOTAL MARKS

A	1, 2, 3	12	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	4,5,6,	11				FIVE			

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

EXAMINATION SCHEME (SESSIONAL)

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

Name of the course : HEATING, VENTILATION & AIR CONDITIONING (Elective)	
Course Code : EEE/ HVAC (EL)S5	Semester : Fifth
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks : 150
Teaching scheme :	Examination Scheme
Theory: 3 Hrs./ Week	Class Test (Internal Examination): 20 Marks
Practical: 2 Hrs./ Week	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
	End Semester Examination: 70 Marks
	Practical: 50 Marks
Credit:	

Aim:	
Sl. No.	
1.	This is a technology subject which is an elective subject for third year diploma in Electrical Engineering. Presently the need of Heating Ventilation and Air conditioning (HVAC) is increasing with the growth in IT sector, commercial establishments, hospitals, hotels etc. Therefore there is a growing need of engineers / technicians in this field. Hence, technicians/supervisors from electrical engineering branch are also expected to have some basic knowledge of HVAC systems.
2.	This subject covers installation, testing and maintenance of Heating Ventilation and Air conditioning systems. After completing this subject the student can carry out installation, testing and maintenance of HVAC equipment efficiently and effectively. He can work as service engineer or get self employed.
3.	Student can work with building management system (BMS).
Objective:	
Sl. No.	Student will be able to:

1.	Install HVAC equipment
2.	Test the equipment for its performance evaluation.
3.	Carryout routine and preventive maintenance of HVAC system.
4.	Troubleshoot and repair HVAC equipment
5.	Calculate heat load and approximate capacity of the equipment using thumb rule
6.	Select appropriate equipment.
Pre-Requisite:	
1.	Basics of electronic instrumentation

	Contents (Theory):	Hrs./Unit	Marks
Unit : 1	**1. Introduction** 1.1 Laws of thermodynamics 1.2 Comparison between heat engine, heat pump and refrigeration 1.3 Definitions of refrigeration, ton of refrigeration, COP, enthalpy, entropy	**2**	**4**
Unit : 2	**Types of refrigeration systems** 2.1 Vapour compression system – components used in vapour compression system, operation of vapour compression system, its representation on P – H and T – S diagrams, effect of superheating and under cooling of refrigerant. 2.2 Vapour absorption system – components used in vapour absorption system, its operation, its merits and demerits compared to vapour compression system 2.3 Air refrigeration system – components used in air refrigeration system, its operation and applications	**4**	**4**
Unit : 3	**Refrigerants and Lubrication** 3.1 Classification of refrigerants 3.2 Types of refrigerants presently in use 3.3 Desirable properties of refrigerants (Physical, chemical, thermodynamic) 3.4 Applications of important refrigerants 3.5 Eco-friendly refrigerants 3.6 Properties of lubricants 3.7 Lubricants and refrigerant compatibility 3.8 Foaming of oil and crankcase electric heater 3.9 Effect of lubricant flood back to compressor 3.10 Additives used in lubricants 3.11 Necessity of oil separator	**6**	**6**
Unit : 4	Components of vapour compression system 4.1 Various types of compressors – reciprocating (hermetic, semi sealed, open), rotary (centrifugal, lobe type, screw type, blade type), applications of each type	**12**	**16**

	4.2 Various types of condensers (air cooled, water cooled, evaporative), applications 4.3 Types of cooling towers – natural draft, forced draft 4.4 Types of evaporators – direct expansion type, flooded type, shell and coil type, double tube type, plate surface type 4.5 Throttling devices – hand expansion valve, constant pressure expansion valve, thermostatic expansion valve, high side float valve, capillary tube, electronic expansion valve 4.6 Accessories – receiver, oil separator, drier, strainer, solenoid valve Note – schematic diagram and brief description only of the above components 4.7 Applications of refrigeration – Ice plant, water cooler, refrigerator, milk dairy, cold storage, breweries, superconductors, transport refrigeration and air conditioning		
Unit : 5	**Airconditioning** 5.1 Psychrometry – Definition, psychrometric properties of air, use of psychrometric chart 5.2 Representation of simple air conditioning process on psychrometric chart. 5.3 Sling psychrometer 5.4 Air conditioning systems (Schematic layout, working and application of each of the following) • Central air conditioning system – direct expansion type, chilled water type • Package type air conditioning system • Unitary air conditioning system, split type system • Evaporative cooling 5.5 Applications of airconditioning – comfort airconditioning, industrial Air conditioning, transport air conditioning.	**5**	**10**
Unit : 6	**Components in air supply and distribution system** 6.1 Fans and blowers (centrifugal, axial flow) – schematic diagram and applications 6.2 Filters – (Dry, viscous, wet, electronic type) – schematic diagram and applications 6.3 Different types of humidifiers and dehumidifiers 6.4 Grills and registers 6.5 Duct system – heat gain or loss in ducts 6.6 Causes of pressure loss through air ducts 6.7 Different methods of duct designing	**4**	**6**
Unit : 7	**Thermal insulation** 7.1 Desirable properties of insulating materials for airconditioning purpose 7.2 Different types of insulating materials used for airconditioning 7.3 Selection of insulating materials for walls, ceiling, floor, air ducts, chilled water pipes	**2**	**4**
Unit : 8	**Controls used in airconditioning**	**3**	**6**

	8.1 High pressure and low pressure cutouts, overload protector, thermostat, oil safety switch, fusible plug, pressure equalizer 8.2 Microprocessor based controls and variable frequency drive 8.3 Fluid flow control devices (simple sketch and wiring diagram is expected		
Unit : 9	**Heat load** 9.1 Definitions– SHF, RSHF, EFSHF 9.2 Factors responsible for heat load 9.3 Conditions of airconditioning and representation of comfort zone on psychrometric chart 9.4 Determination of capacity of airconditioning unit by referring tables only (no calculations)	**3**	**6**
Unit : 10	**Heating and ventilation** 10.1 Plain heating, electric heating, steam heating, hot water heating, solar heating 10.2 Heating with humidification and heating with dehumidification 10.3 Natural ventilation 10.4 Mechanical ventilation – 1) Air extraction system 2) Air supply system, combined supply and extraction system 10.5 Air distribution system – perimeter system, extended plenum system, upward flow system, downward flow system, ejector system 10.6 Return duct system (only schematic diagrams and brief description of the above system)	**7**	**8**
	Total	**48**	**70**

Practical:
Skills to be developed:
Intellectual Skills:
1. Interpret results.
2. Write specifications
Motor Skills:
1. Conduct trial
2. Read drawing and identify components
3. Carry out Welding
List of practical: (At least Eight Experiments are to be performed)
1. To carryout trial on vapour compression test rig for finding its performance.
2. To dismantle and assemble open type and hermetic type compressors, to draw freehand sketches of various parts and to write specifications of compressors.
3. To carryout copper tube welding
4. To study and draw block diagram of control panel wiring with respect to L.P. / H.P. cutouts, oil pressure cutout, thermostat, humidistat, solenoid valve
5. To troubleshoot the air-conditioning plant in relation to a) High condenser pressure b) Low cooling effect c) Reduced volume of supply of air d) compressor not starting

6. To prepare maintenance schedule of central air conditioning plant – weekly, quarterly, half yearly, yearly
7. To demonstrate and study of various tools used in refrigeration such as – tube cutter, bending tools, flaring tool (block and yoke type), swaging tool, brazing tool, blow lamp etc
8. To demonstrate purging, gas charging, leak testing and pump down of the refrigeration system
9. To visit to air conditioned hotel or theater to study control panel and various controls, starting and stopping system, air supply and air return system. Write a detailed report.
10. To visit to cold storage to study different components of vapour compression system, temperature and humidity conditions required for different food items. Write a detailed report
11. To prepare a report (use internet) based on the following points to purchase an air conditioner: i) Manufactures, ii)Technical specifications, iii) Features offered by different manufacturers, iv) Price range. Then select the air conditioner which you would like to purchase. Give justification for your selection in short.
Note: For visits professional practices periods may be utilized.

List of Text Books:

Sl. No.	Name of Author	Title of the Books	Name of Publisher
1.	P. N. Anathanarayanan	Basic Refrigeration and Air-conditioning	Tata Mcgraw Hill, New Delhi
2.	M. Adithan, S.C. Laroyia,	Practical Refrigeration and Air-conditioning	New Age International (P) Ltd.

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	*TO BE ANSWERED*	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3,4,5	12	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	6,7,8,9 ,10	11				FIVE			

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

EXAMINATION SCHEME (SESSIONAL)

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Fifth Semester. **Distribution of marks: Performance of Job – 15, Notebook – 10.**

2. **External Assessment of 25 marks** shall be held at the end of the Fifth Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. **Distribution of marks: On spot job – 15, Viva-voce – 10.**

Name of the course : Electric Traction (Elective)			
Course Code : EEE/ET(EL)S5		Semester : Fifth	
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)		Maximum Marks : 100+50	
Teaching scheme :		Examination Scheme	
Theory: 3 Hrs./ Week		Class Test (Internal Examination): 20 Marks	
Practical: 2 Hrs./ Week		Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks	
		End Semester Examination: 70 Marks	
		Practical: 50 Marks	
Credit:			
Aim:			
Sl. No.			
1.	One of the practical applications of electricity, which enters into the everyday life of many of us, is its use in service of mass transport – the electric propulsions of vehicles – electric trains, trolley buses, tram cars and in the latest developments such as metro and sky bus.		
2.	In view of the growing importance and technological developments, which have come about in this area in the recent past; for Electrical Engineering students, it is desirable to study the course dealing with electric traction.		
Objective:			
Sl. No.	Student will be able to:		
1.	Identify and explain use of components of the power supply arrangements for electric traction.		
2.	Maintain different overhead equipments.		
3.	Differentiate the various types of current collecting systems and current collecting gears based on utility.		
4.	Differentiate the various types of current collecting systems.		
5.	Explain special requirements of train lighting and various systems of train lighting.		
6.	Describe the recent trends in Electric traction, such as LEM propelled traction		
Pre-Requisite:			
1.	A.C and D.C. Motors and Power Supply		
Contents (Theory):		Hrs./Unit	Marks

Unit : 1	1.1 - Nomenclature used For Electric Locomotives 1.2 - Types of Electric Locomotives by Nomenclature. 1.3 – AC Locomotive: 1.3.1 - Equipments of AC Electric Locomotive: - Power Circuit Equipments and Auxiliary Circuit Equipments. 1.3.2- Equipments in Power Circuit and their Functions: - Power Circuit Diagram of AC Locomotive: Pantograph, Circuit breaker, Tap Changer, Traction Transformer, Rectifier, Smoothing, Choke, Traction Motor. 1.3.3 - Equipments in Auxiliary Circuit & their Functions: Head Light, Flasher Light, Horn, Marker Light, Batteries, Arno Converter, Blowers, Exhausters, Compressors, Selsyn transformer.	**12**	**18**
Unit : 2	2.1 – Constituents of Supply System: Substations, Feeding Posts, Feeding and Sectioning Arrangements, Sectioning and Paralleling Post, Sub sectioning and Paralleling Post, Sub sectioning Post, Elementary Section, Miscellaneous Equipments at Control Post or Switching Stations. 2.2 – List of Major Equipments at Substation. 2.3 – Location and spacing of substation.	**08**	**10**
Unit : 3	**Overhead Equipments:** 3.1 – Overhead Equipments (OHE). 3.2 – Principles of Design of OHE: Composition of OHE, Height of Contact Wire, Contact Wire Gradient, Encumbrances, Span Length. 3.3 – Automatic Weight Tension and Temp. Compensation. 3.4 – Uninsulated Overlaps. 3.5 – Insulated Overlaps. 3.6 – Neutral Section. 3,7 – Section Insulator. 3.8 – Isolator. 3.9 – Polygonal OHE: Single Catenary Construction, Compound Catenary Construction, Stitched Catenary Construction, Modified Y Compound Catenary. 3.10 – Effect of Speed on OHE. (No derivation and No numerals)	**09**	**12**
Unit : 4	**Current Collecting Equipments**: 4.1 – Introduction. 4.2 – Systems of Supplying Power in Electric Traction: Overhead System, Third Rail or Conductor Rail System. 4.3 – Current Collectors for Overhead System: - Trolley Collector or Pole Collector, Bow Collector, Pentograph Collector. 4.4 – Types of Pentographs: Diamond Pentograph and Faiveley Type. 4.5 – Methods of raising and lowering of Pentograph	**06**	**10**

Unit : 5	Train Lighting: 5.1 – Systems of Train Lighting. 5.2 – Special Requirements of Train Lighting. 5.3 – Method of obtaining Unidirectional Polarity. 5.4 – Method of obtaining Constant Output. 5.5 – Single Battery System. 5.6 – Double Battery Parallel Block System.	**05**	**08**
Unit : 6	LEM Propelled Traction: 6.1 – Introduction. 6.2 – Linear Electric Motor (LEM) 6.3 – Linear Induction Based Traction System: - Moving Primary Fixed Secondary Single Sided LIM. -Moving Secondary Fixed Primary Single Sided LIM. -Moving Primary Fixed Secondary Double Sided LIM. 6.4 – Strengths/Weaknesses of LIM Propelled Railway Traction: -Strengths of LIM Propelled Railway Traction System. -Weaknesses of LIM Propelled Railway Traction System. 6.5 – LIM Propelled Underground Metro Rail System: - Factors Influencing Adoption of LIM for Metro Rail. -International Scenario. 6.6 – Wheel Less Traction: Levitation Schemes, Present Scenario. 6.7- National & CIE standards of exterior lighting calculation.	**08**	**12**
	Total	**48**	**70**

List of practical: Nature of work (students are expected to identify and explain function of each item related to their work)

1. To study of Electric AC Locomotives.
2. To study of Different types of Relays, Contactors used in AC Locomotive
3. To prepare drawing (on half Imperial sheet) for Power Circuit of any type of Electric Locomotive
4. To prepare drawing (on half Imperial sheet) for Protection of Electric Locomotive.
5. To prepare drawing on half Imperial sheet for Traction Substation Layout or Feeding Post
6. To prepare drawing on half Imperial sheet for Pentagonal OHE Catenary, Different Catenary according to speed limit, Cantilever assembly, OHE Supporting structure, Pantograph, Cross section of Contact Wire.
7. To visit to Traction Substation (for substation layout and OHE) and writing a report. Also write a report on OHE maintenance schedule.
8. To visit to Railway Station (for signaling and train lighting) and writing a report
9. Mini Project: Collection of information using Internet on any two topics related to electric traction and submission of printouts

List of Text Books:

Sl. No.	Name of Author	Title of the Books	Name of Publisher
1.	H. Partab	Modern Electric Traction	Dhanpat Rai & Sons.

2.	J. Upadhyay S. N. Mahendra	Electric Traction	Allied Publishers Ltd.
3.	Andreas Steimel	Electric Traction –Motive Power and Energy supply	Oldenbourg-indstrieverlag

EXAMINATION SCHEME (THEORITICAL)

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

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

EXAMINATION SCHEME (SESSIONAL)

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

\

Name of the course : Computer Hardware Maintenance (Elective)	
Course Code : EEE/CHM(EL)/S5	Semester : Fifth
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks : 100+50
Teaching scheme :	Examination Scheme
Theory: 3 Hrs./ Week	Class Test (Internal Examination): 20 Marks
Practical: 2 Hrs./ Week	Teacher's Assessment (Attendance, Assignment & interaction): 10 Marks
	End Semester Examination: 70 Marks
	Practical: 50 Marks
Credit:	
Aim:	

Sl. No.	
1.	To do the maintenance of the Computer, peripherals and its add-on cards
2.	To understand basic working of the computer motherboard, peripherals and add-on cards
3.	To select the proper peripheral as per their specification and requirement.
Objective:	
Sl. No.	Student will be able to:
1.	Debug and repair the faults in system.
2.	Assemble the system.
3.	Load the operating system and device drivers in the system
Pre-Requisite:	
1.	Basic knowledge of Computer.

	Contents (Theory):	Hrs./Unit	Marks
Unit : 1	**1. PC HARDWARE OVERVIEW:** 1.1 PC EVOLUTION: Feature of Intel Processors - Pentium, P2, P3, P4, Dual Core, Core i3, i5, i7 and AMD processors : K6, Athlon XP, Athlon 64. 1.2 INSIDE THE SYSTEM UNIT: Block diagram of the PC system, system box types, system main components and their overview including the rear side connectors. 1.3 Chipset basic, chipset Architecture: North / South Bridge architecture and Hub architecture, Architecture of Intel chipset 915 G & 945 G 1.4 MOTHERBOARD: Motherboard Selection criteria & layouts, upgrades, functional description of important blocks and their interconnection. 1.5 BUSES & EXPANSION SLOTS: Different bus architecture features, of ISA, PCI-X, PCI-Xpress, AGP, PCMCIA, AGP, Processor BUS (no pin description) PCI versus PCI Express, 1.6 BIOS: Basic ROM BIOS organization, services, BIOS, DOS, Windows interaction principle. 1.7 CMOS: Setup, configuration and utility.	**08**	**10**
Unit : 2	**2. MAIN MEMORY SYSTEM & STORAGE DEVICES:** 2.1 Motherboard Memory: Features of PC's memory organization: Primary, Secondary, Memory Packages: SIMM & DIMM, Extended Memory, Virtual Memory, Expanded Memory –: DRAM including features of SDRAM, DDR, DDR2, DDR3, Disk Organization in DOS: Sectors, Cluster, DBR, MBR, FAT, root directory. 2.2 Concept of cache memory : Internal cache, External cache (L1, L2, L3 cache) 2.3 Hard Disk Drive: Hard disk construction and working 2.3.1 Servo Techniques : Wedge servo, Embedded servo,	**8**	**10**

	dedicated servo Terms related to Hard Disk : Track, Sector cylinder, cluster, landing zone, MBR, Zone recording, write pre-compensation 2.3.2 Formatting, Low level formatting, High level formatting, Partitioning 2.3.3 FAT basics, Introduction to file system FAT 16, FAT 32, NTFS 2.3.4 Hard disk drive interface : features of parallel AT attachment (PATA), Serial ATA (SATA), ATA devices jumper selections : Master, slave, cable select, ATA cables 2.4 ATA RAID : RAID 0, RAID 2.5 CDROM drive : Construction, Recording 2.6 CD-ROM Disks & Drives: Types, audio, video, DVD – Construction, Recording, Reading, Basics: Speed – Storage capacity – Subassembly components and installation. 2.7 Blu-ray disk specification and pen drive		
Unit : 3	**3. MONITORS AND INTERFACING:** 3.1 MONITORS AND THEIR INTERFACES: Block diagram description of a Video Controller Card and Monitor – Display Adapters: CGA, VGA and SVGA card — Features, Resolution and Monitor features, Graphics display characteristics – Video attributes. 3.2 Comparison of CRT display related to LCD display 3.3 LCD monitor: functional block diagram of LCD monitor, working, principal, advantages and disadvantages Types : Passive matrix and 3.4 Active matrix, Important characteristics : Resolution, Refresh rate, 3.5 Response time 3.6 Basic block diagram of a video accelerator care.	**7**	**9**
Unit : 4	**4.1 Keyboard :** Types of key switches and signals : Membrane, Mechanical, Rubber dome, Capacitive and interface 4.2 Mouse : Mechanical, Optomechanical, optical (New design)-principle of operation and installation 4.3 Scanner : Flat bed, sheet fed, Handheld : Block diagram and specifications 4.4 Printer : Dot matrix, Inkjet, Laser : Block diagram and specifications, self test of printer, interface requirements. Use of tonner and ink cartridge 4.5 PORT: Serial Port: Features, Signals, Connector specification – Parallel Port: Features, Signals, Connector specification – **Game** Port: Features – Connector specification 4.6 U.S.B.: Features – Specification.	**08**	**10**
Unit : 5	**5. Power supplies:** 5.1 POWER APPLIANCES: SMPS: Output voltage and current levels, Types and variations, Uses,	**4**	**8**

	5.2 Power management features – UPS & Voltage Stabilizer: Installation features, 1.3 Power requirement calculation for UPS / Stabilizer 5.3 Power problems : Blackout, Brownout, surges and spikes 5.4 Symptoms of power problems.		
Unit : 6	**6. Multimedia Devices:** 6.1 Sound Blaster and Video capture cards, Basics of digital sound,	**2**	**5**
Unit : 7	**PC ASSEMBLING & TROUBLE SHOOTING** 7.1 Motherboard configuration – Adding memory modules – Identifying connectors and cables – Upgrading CPUs – BIOS set up program and configuration. 7.2 POST: IPL hardware – POST sequences – Error messages. 7.3 TROUBLESHOOTING (MOTHERBOARD & KEYBOARD): problem diagnosis, normal checks, power supply, clock signal check, preventive maintenance measures, verifying with diagnostic tools, troubleshooting tips. 7.4 TROUBLESHOOTING (FDD, HDD & PRINTER): Problem diagnosis – Typical problems & troubleshooting — CMOS troubleshooting, isolation of the problems using self-test, cable check, port problem, software problem, head problem.	**7**	**10**
Unit : 8	**SOFTWARE INSTALLATION** 8.1 OS Installation – DOS, Win XP (SP 2 or SP3) / Windows7/ Windows 8 Advanced Server, 2008 Server, Linux/Unix Installation, Device Driver Commissioning 8.2 Application Software installation – Anti Virus, Office Management etc	**4**	**8**
	Total	**48**	**70**

Practical:
Skills to be developed:
Intellectual Skills:
1. Understanding basic hardware of computer
2. Fault finding of input/output devices
3. Troubleshooting of input/output devices
4. Proper connection of input / output devices
Motor Skills:
1. Proper handling of Computer hardware System
List of practical:
1. Drawing the motherboard layout of Pentium IV and studying the chipset through data books or Internet.

2. Study of Hard Disk Partitioning
3. Study of HDD: Identify various components of HDD and write their functions.
4. Study and installation of any one display cards: VGA or SVGA display cards.
5. Study of SMPS
6. Monitor related fault finding
7. CPU related fault finding.
8. Assembling of PC and Installation of Operating System.

List of Text Books:

Sl. No.	Name of Author	Title of the Books	Name of Publisher
1.	K L James	Computer Hardware	PHI.
2.	Brenner	IBM PC troubleshooting & Repairing	BPB
3.	R. Gilster	PC hardware a beginner's guide	Tata Mc-Graw-Hill

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	*TO BE ANSWERED*	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3,4	12	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	5,6,7,8	11				FIVE			

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

EXAMINATION SCHEME (SESSIONAL)

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

Name of the course: **Industrial Project & Entrepreneurship Development**	
Course Code: EEE/ EDP /S5	Semester: Sixth
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 50 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 1Contact hrs./ week	Class Test (Internal Examination):
Tutorial: nil	Teacher's Assessment (Attendance, Assignment & interaction):
Practical: 2 contact hours/ week	Term Work: 50 Marks
Credit: 2 (Two)	
Rationale:	

- To Understand Market Assessment
- To Identify entrepreneurship creativity and opportunities
- To improve students skill to prepare report for business venture

Objectives:

The student will be able to:

- ✓ Identify entrepreneurship opportunity.
- ✓ Acquire entrepreneurial values and attitude.
- ✓ Use the information to prepare project report for business venture
- ✓ Develop awareness about enterprise management.

	Content Theory (Name of topic)	**Periods**	**Marks**
	Group-A		
Unit 1	**Entrepreneurship, Creativity & Opportunities**	6	
	1.1) Concept, Classification & Characteristics of Entrepreneur 1.2) Creativity and Risk taking. 1.2.1) Concept of Creativity & Qualities of Creative person. 1.2.2) Risk Situation, Types of risk & risk takers. 1.3) Business Reforms. 1.3.1) Process of Liberalization. 1.3.2) Reform Policies. 1.3.3) Impact of Liberalization. 1.3.4) Emerging high growth areas. 1.4) Business Idea- Methods and techniques to generate business idea. 1.5) Transforming Ideas in to opportunities transformation involves Assessment of idea Feasibility of opportunity 1.6) SWOT Analysis 1.1		
Unit 2	**Information And Support Systems**	6	
	2.1) Information Needed and Their Sources. Information related to project, Information related to support system, Information related to procedures and formalities **2.2) SUPPORT SYSTEMS** 2.2.1 Small Scale Business Planning, Requirements. 2.2.2 Govt. & Institutional Agencies, Formalities		

	2.2.3 Statutory Requirements and Agencies. 2.2.4 Support Institutions and their Roles:		
Unit 3	**Market Assessment**	3	
	3.1) Marketing -Concept and Importance 3.2) Market Identification, Survey Key components 3.3) Market Assessment		
	Group – B		
Unit 4	**Business Finance & Accounts**	6	
	Business Finance 4.1) Cost of Project • Sources of Finance • Assessment of working capital • Product costing • Profitability • Break Even Analysis • Financial Ratios and Significance **Business Account** 4.2) Accounting Principles, Methodology 1) Book Keeping 2) Financial Statements 3) Concept of Audit,		
Unit 5	**Business Plan & Project Report**	4	
	5.1) Business plan steps involved from concept to commissioning- Activity Recourses, Time, Cost 5.2) **Project Report** 1) Meaning and Importance 2) Components of project report/profile **(Give list)** 5.3) **Project Appraisal** 1) Meaning and definition 2) Technical, Economic feasibility 3) Cost benefit Analysis		
Unit 6	**Enterprise Management And Modern Trends**	8	
	6.1) **Enterprise Management**: 1) Essential roles of Entrepreneur in managing enterprise 2) Product Cycle: Concept And Importance 3) Probable Causes Of Sickness 4) Quality Assurance : Importance of Quality, Importance of testing 6.2) **E-Commerce:** Concept and process 6.3) **Global Entrepreneur**		
		16	

Contents Practical
Skills to be developed: On satisfactory completion of the course, the students should be in a position to design few fundamental networks. **Intellectual Skills:** **Motor Skill:**
Suggested List of Laboratory Experiments: Nil

Sr. No	**Assignments**
1	Assess yourself-are you are entrepreneur?
2	Prepare project report and study its feasibility

Sr.No	**Author**	**Name Of Book**	**Publisher**
1.	Alpana Trehan	Entrepreneurship	Dreamtech press/ Kogent Learning solutions
1	J.S. Saini, B.S.Rathore	Entrepreneurship Theory and Practice	Wheeler Publisher, New Delhi
2	E. Gorden, K.Natrajan	Entrepreneurship Development	Himalaya Publishing.
3	Prepared by Colombo Plan Staff College for Technician Education.	Entrepreneurship Development	Tata McGraw Hill
4	J.B.Patel, D.G.Allampally	A Manual on How to Prepare a Project Report	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
5	J.B.Patel, S.S.Modi	A Manual on Business Opportunity Identification & Selection	
6	S.B.Sareen, H. Anil Kumar	National Derectory of Entrepreneur Motivator & Resource Persons.	
7	Gautam Jain, ,Debmuni Gupta	New Initiatives in Entrepreneurship Education & Training	
8	P.C.Jain	A Handbook of New Enterpreneurs	
9	D.N.Awasthi, Jose Sebeastian	Evaluation of Enterpreneurship Development Programmes	
10	V.G.Patel	The Seven Business Crisis & How to Beat Them.	

Video Cassettes

Sr. No.	Subject	Source
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport

2	Assessing Entrepreneurial Competencies	& Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	

Glossary:

Industrial Terms:

Terms related to finance, materials, purchase, sales and taxes.

Components of Project Report:

1. Project Summary (One page summary of entire project)
2. Introduction (Promoters, Market Scope/ requirement)
3. Project Concept & Product (Details of product)
4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)
5. Manufacturing Process & Technology
6. Plant & Machinery Required
7. Location & Infrastructure required
8. Manpower (Skilled, unskilled)
9. Raw materials, Consumables & Utilities
10. Working Capital Requirement (Assumptions, requirements)
11. Market (Survey, Demand & Supply)
12. Cost of Project, Source of Finance
13. Projected Profitability & Break Even Analysis
14. Conclusion.

Name of the course: Professional Practice-III	
Course Code: EEE/PP-III/S5	Semester: Fifth
Duration: 17 weeks (Teaching-15 weeks + Internal Exam-2 weeks)	Maximum Marks: 50
Teaching Scheme:	**Examination Scheme :**
Theory:	Internal Teachers' Assessment: 50 Marks
Tutorial:	
Practical: 3 contact hours/ week	End Semester Examination: Nil
Credit: 2	
Rationale:	
In addition to exposure both in theoretical and practical from an academic institution, it is desired that student should be familiar with the present day industry working environment and understand the emerging technologies used in these organisation. Due to globalization and competition in the industrial and service sectors, acquiring overall knowledge will give student better opportunity for placement facility and best fit in their new working environment. In the process of selection, normal practice adopted is to see general confidence, positive attitude and ability to	

communicate, in addition to basic technological concepts. The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.
Objectives:
The student will be able to- **Student will be able to:** **1. Acquire information from different sources.** **2. Enhance creative skills** **3. Prepare notes for given topic.** **4. Present given topic in a seminar.** **5. Interact with peers to share thoughts.** **6. Develop capability of working in UNIX operating environment** **7. Understand Open Source Software- "SCILAB" is a perfect substitute for MATLAB, for numerical computations.** **8. Understand application of technologies in industry scenario.** **9. Prepare a report on industrial visit, expert lecture.**

01	**Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work.** Following are the suggested type of Industries/ Fields –(Any three visits) 1. Data Acquisition System 2. Sugar Mill, Paper Mill, Cement Industry 3. Satellite Earth Station 4. Railway Station Control Room 5. Digital RPM Meter Manufacturing Unit 6. Industry where Digital Drives are used 7. Digital Counters	**16**
02	**The Guest Lecture/s from field/industry experts, professionals to be arranged (2 Hrs), minimum 3 nos. (Topics at Sl. No. A & B are compulsory and chose any one from the following or alike topics). Students should submit a brief report on the guest lecture as part of Term Work** **a. Operating System "UNIX" an Overview:** Hands-on demonstration of Linux (ubuntu) Open Source operating system software, its installation , different features, use of its different components and its equivalency with windows operating system **b. Introduction to MATLAB & ITS Open Source Equivalent SCILAB and hands on demonstration:** 1. Introduction and Installation Of MATLAB & SCILAB and Vector Operations 2. Matrix Operations and Scripts and functions 3. Conditional Branching and Iterations and Plotting in Scilab 4. SBHS and Introduction to X-Cos in Scilab c. Peripheral Devices d. Blue Tooth Technology e. Energy Crisis and Alternative Energy Sources f. Digital Invertors g. Laptop & Tablet Repair h. Total Quality Management i. Six Sigma	**14**
03	**Information Search ,data collection and writing a report on the topic** 1. Wireless Communication 2G GSM 2. CDMA 3. GPS 4. Manufacturing process of ICs 5. WLL Technology	**10**
04	**Group Discussion:** The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are -	**10**

05	**Seminar :** Seminar topic should be related to the subjects of fifth semester Each student shall submit a report of 5 to10 pages and deliver a seminar (Presentation time – 10 minutes)	**10**
	Total	**60**

Reference Book

1. Ubuntu Linux bible: Featuring Ubuntu 10.04 LTS, 3rd ed. By William Von Hagen (Willey India)
2. Matlab programming by Singh (PHI)
3. Lab Primer through MATLAB, Naresh (PHI)