WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA COURSES

COURSE NAME: ***ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)***
COURSE CODE : ***EEIC***
DURATION OF COURSE : 6 SEMESTER
SEMESTER: ***SIXTH SEMESTER***

Sl. No.	SUBJECT	PERIODS			EVALUATION SCHEME							CREDITS
	THEORY	L	T	P	SESSIONAL EXAM			ESE	PR (INT.)	PR (EXT.)	TOTAL MARKS	
					TA	CT	TOTAL					
1	Industrial Control - II	04	--	--	10	20	**30**	70	--	--	**100**	3
2	Electrical Installation, Maintenance & Safety	04	--	--	10	20	**30**	70	--	--	**100**	3
3	Industrial Control - III	04	02	04	10	20	**30**	70	50	50	**200**	5
4	Industrial Management	03	--	--	10	20	**30**	70			**100**	3
5	***Elective – II*** (Any One) 1) Control of Electrical Machines 2) Industrial Automation 3) Computer Hardware & Networking	03	--	02	10	20	**30**	70	25	25	**150**	4
6	Industrial Project	--	--	04					50	50	**100**	2
7	Professional Practices - IV	--	--	03					50		**50**	2
8	General Viva Voce	--	--	--					100		**100**	2
	TOTAL	***18***	***02***	***13***	***50***	***100***	***150***	***350***	***275***	***125***	***900***	***24***

STUDENT CONTACT HOURS PER WEEK: **33 HRS**
THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH
, External Assessment @ , Internal Assessment ESE - End Semester Exam.
ABBREVIATIONS: CT- Class Test, TA - Teachers Assessment, L - Lecture, T - Tutorial, PR (INT.) – Practical (Internal)
PR(EXT.)- Practical(External)
TA: Attendance & surprise quizzes = 6 marks. Assignment & group discussion = 4 marks.
Total Marks : 900
Minimum passing for sessional marks is 40%, and for theory subject 40%.

Name of the Course: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)*** Subject : **INDUSTRIAL CONTROL-II**	
Course Code: ***EEIC/S6/IC-II***	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***100***
Teaching Scheme	**Examination Scheme**
Theory : 4 hrs./week	Mid Semester Exam.: **20 Marks**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **10 Marks**
Practical: -- hrs./week	End Semester Exam.: **70 Marks**
Credit: 3	Practical: **NIL**

Aim:

SI. No.	
1.	To get knowledge about safety and precautions.
2.	To know about various control systems and control equipments.

Objective:

SI. No.	The student will be able to know :
1.	Various control equipments
2.	Various control circuits
3.	Various driving systems

Pre-Requisite:

SI. No.	
1.	Knowledge of various control processes and electrical control equipments.

DETAILED CONTENTS

UNIT	*CONTENTS*	*HOURS*	*MARKS*
1	***1. Electric Drives: (12)*** (i) Definition of Electric drives, Block diagram explanation of conventional and Modern electric drives, Advantages of electric drive. (ii) Types of electric drive - Group, Individual and Multi-motor types and their applications. (iii) One quadrant, Two quadrant and Four quadrant electric drive with their applications. (iv) Constant torque and constant power control of electric drive and their use. (v) Characteristics of different mechanical loads (Variation of torque/power with respect to speed and time only). (vi) Types of motors used in electric drive and their relative merits and demerits. (vii) Use of flywheels for fluctuating load (Only Physical Concept). (viii) Determination of motor rating for continuous, short time and intermittent duty (Constant speed application only), Simple Numerical Problems. (ix) Types of enclosure and their use. (x) Necessity of mechanical power transfer; Methods of power transfer by devices like belt drive, pulley drive and gear drive with their field of applications. (xi) Criteria for the selection of motors for particular loads; selection of motors for general workshop, crane and lift, textile mill, paper mill, steel mill and mine winders, printing press. (xii) Specification of commonly used motors.	***16***	***20***

UNIT	*CONTENTS*	*HOURS*	*MARKS*
2	***2. Electric Traction:(13)*** 2.1. Types of Locomotives. 2.2. - Electric Locomotive: 2.3.1. Equipments of Electric Locomotive: Power Circuit Equipments and Auxiliary Circuit Equipments 2.3.2. Systems of Supplying Power in Electric Traction: Overhead System, Third Rail or Conductor Rail System. 2.3.3. Equipments in Power Circuit and their Functions: Power Circuit Diagram of AC Locomotive. 2.3.4. Different current collector devices. 2.3.5. Constituents of Supply System: Substations, Feeding Posts, Feeding and Sectioning Arrangements, Neutral section. 2.3.6. List of Major Equipments at Substation 2.3.7. Location and spacing of substation. 2.3.8. Overhead electrification. 2.1. Motor used in traction - D.C. & A.C. motors with their performance & characteristics. 2.2. Speed Time curve, Average & Schedule Speed 2.3. Tractive Effort: Simple problems related to tractive effort and power requirements. Mechanism of Train mopvement. 2.4. Speed control of DC traction motors - Rheostatic control, Thyristor control. 2.5. Starting of DC motor – Energy consideration in case of series-parallel starting. 2.6. Regenerative braking and calculation of energy returned during regenerative breaking. 2.4.1. Various Signaling system.	*24*	*20*
3	***3. Refrigeration and air conditioning: (10)*** (i) Concept of refrigeration and air conditioning. (ii) Brief description of vapour compression refrigeration cycle. (iii) Description of electrical circuit used in (a) Refrigerator, (b) Air conditioner, and (c) Water cooler.	*7*	*10*
4	***4. INDUSTRIAL CONTROL CIRCUITS: (8)*** (i) Heater control (ii) Compressor motor control (iii) Skip hoist control (iv) Walking beam (v) Battery operated truck (vi) Conveyor system control (vii) Lift circuit	*10*	*12*
5	***5. A.C. CONTROL CIRCUITS: (5)*** (i) Sequence starting of motors (ii) Starting of multispeed squirrel cage motor (iii) Over-load protection of motors (iv) Single phase protection (v) Over-temperature protection	*7*	*8*
	TOTAL	*64*	*70*

Text Books:

Name of Authors	Title of the Book	Name of the Publisher

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,	14	TWENTY	ONE	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	3,4,5	9				FOUR			

Name of the Course: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)***	
Subject : ***Electrical Installation , Maintenance , Testing***	
Course Code: ***EEIC/S6/EIMT***	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***100***
Teaching Scheme	**Examination Scheme**
Theory : 4 hrs./week	Mid Semester Exam.: **20 Marks**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **10 Marks**
Practical: -- hrs./week	End Semester Exam.: **70 Marks**
Credit: 3	Practical: **NIL**

Aim:

SI. No.	
1.	This is technology level subject with application in Industry, commercial, public utility departments such as PWD, Electricity Board etc.
2.	After studying this subject student will be able to inspect, test, install & commission electrical machines as per IS .

Objective:

SI. No.	The student will be able to:
1.	• Know safety measures & state safety precautions.
2.	• Test single phase, three phase transformer, DC & AC machine as per IS.
3.	• Identify / Locate common troubles in electrical machines & switch gear.
4.	• Plan & carry out routine & preventive maintenance.
5.	• Install LV switchgear & maintain it.
6.	• Ascertain the condition of insulation & varnishing if necessary.
7.	• Identify faults & measures to repair faults.

Pre-Requisite:

SI. No.	
1.	Knowledge of electrical equipments

Contents (Theory)

Unit	Contents (Theory)	Hrs./Unit	Marks
1	***Safety & Prevention of Accidents:*** 1.1. Definition of terminology used in safety 1.2. I.E. Act & statutory regulations for safety of persons & equipments working with electrical installation 1.3. Dos & don'ts for substation operators as listed in IS. 1.4. Meaning & causes of electrical accidents factors on which severity of shock depends, 1.5. Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, 1.6. Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers	5	5
2	***General Introduction:*** 2.1. Objectives of testing significance of I.S.S. concept of tolerance, routine tests, type tests, special tests. 2.2. Methods of testing a) Direct, b) Indirect, c) Regenerative. 2.3. Classification and need of maintenance 2.4. Advantages of preventive maintenance, procedure for developing preventive maintenance schedule, 2.5. Factors affecting preventive maintenance schedule. 2.6. Introduction to total productive maintenance.	5	5
3	***Testing & maintenance of rotating machines*** 3.1. Type tests, routine tests & special tests of 1 & 3 phase Induction motors, 3.2. Routine, Preventive, & breakdown maintenance of 1 & 3 phase	10	10

Unit	Contents (Theory)	Hrs./Unit	Marks
	Induction motors as per IS 9001:1992 3.3. Parallel operation of alternators, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968 3.4. Brake test on DC Series motor.		
4	***Testing & maintenance of Transformers:*** 4.1. Listing type test, routine test & special test as per I.S. 2026-1981 4.2. Procedure for conducting following tests: Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, Impulse voltage withstand test, Temperature rise test of oil & winding, Different methods of determining temp rise-back to back test, open delta (delta – delta) test. 4.3. Preventive maintenance & routine maintenance of distribution transformer as per I.S. 10028(part III): 1981	10	10
5	***Testing & maintenance of Insulation:*** 5.1. Classification of insulating materials as per I.S. 8504(part III) 1994. 5.2. Factors affecting life of insulating materials. 5.3. Methods of measuring temperature of internal parts of windings/ machines & applying the correction factor when the machine is hot. 5.4. Properties of good transformer oil. List the agents which contaminates the insulating oil. 5.5. Understand the procedure of following tests on oil as per I.S. 1692-1978 a) acidity test b) sludge test c) crackle test d) flash point test. 5.6. Filtration of insulating oil 5.7. Protection of electrical insulation during the period of inactivity. 5.8. Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & revarnishing. 5.9. Methods of internal heating & vacuum impregnation.	8	10
6	***Trouble shooting of Electrical Machines & Switch gear:*** 6.1. Significance of trouble shooting of various electrical machines and describes the procedure for the same. 6.2. Various types of faults (mechanical, electrical & magnetic) in electrical machines and reason for their occurrence. 6.3. Use of following tools: Bearing puller, Filler gauge, dial indicator, spirit level, growler. 6.4. Trouble shooting charts for Single & 3-phase induction motor, Single & 3- phase transformer. 6.5. List the common troubles in HV and LV switchgear, contactors & batteries.	8	10
7	***Installation:*** 7.1. Inspection procedure of Machine Installation. 7.2. Factors involved in designing the machine foundation, 7.3. Requirement of different dimension of foundation for static & rotating machines procedure for levelling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment. 7.4. Installation of rotating machines as per I.S. 900-1992. 7.5. Use of various devices & tools in loading & unloading, lifting, carrying heavy equipment. 7.6. Method of drying out of Machines. 7.7. Classification of transmission tower 7.8. Installation of Transmission Tower (From foundation to complete erection).	12	10
8	***Earthing:*** 8.1. Introduction & importance. 8.2. Step potential & Touch potential. 8.3. Factors affecting Earth Resistance.	6	10

Unit	Contents (Theory)	Hrs./Unit	Marks
	8.4. Methods of earthing 8.5. Substation and Transmission Tower earthing 8.6. Transformer Neutral Earthing.		
	TOTAL	64	70

Text Books:

Name of Authors	Title of the Book	Name of the Publisher
Tarlok Sibgh	Installation, Commissioning & Maintenance of Electrical Equipment	S.K.Kataria & Sons
B.V.S.Rao	Operatin & Maintenance of Electrical Machines Vol I & II	Media Promoters & Publisher Ltd. Mumbai

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	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	6,7,8	11				FOUR			

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.

Name of the Course: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)*** Subject : **INDUSTRIAL CONTROL-III**	
Course Code: ***EEIC/S6/IC-III***	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***200***
Teaching Scheme	**Examination Scheme**
Theory : 4 hrs./week	Mid Semester Exam.: **20 Marks**
Tutorial : 2 hrs./week	Attendance, Assignment & interaction: **10 Marks**
Practical : 4 hrs./week	End Semester Exam.: **70 Marks**
Credit : 5	Practical: **100**

Aim:

SI. No.	
1.	To get knowledge about Programmable Logic Controller (PLC).
2.	To get knowledge about Discrete input / Output module.
3.	To know about Distributed Control System (DCS).
	To get knowledge about Supervisory Control & Data Acquisition (SCADA).

Objective:

SI. No.	The student will be able to know :
1.	Various control Logics & their hardwares.
2.	How to design control circuits & ladder diagrams.
3.	How to make programme for various logic controllers.

Pre-Requisite:

SI. No.	
1.	Knowledge of various control processes and electrical control equipments.

UNIT	CONTENTS	HOURS	MARKS
1	**Introduction to Programmable Logic Controller** (10) PLC evolution, Overview, Functions & Features. Typical areas of Application. PLC vs Personal Computers, PLC vs Dedicated Controllers, Hardwire control system compared with PLC system, Advantages of PLCs, Criteria for selection of suitable PLC. Block diagram of PLC, Principle of operation, CPU, memory organization, I/O modules, Input types – Logic, Analog – pulse train, Expansion modules, Power supplies to PLC, Modular PLCs - list of various PLCs available	**10**	**15**
2	**Input Modules (5)** Discrete input module, AC input module, DC input module, sinking and sourcing, sensor input, Special input modules – Sensors – limit switch, reed switch, photo electric sensor, inductive proximity sensor – Input Addressing scheme in important commercial PLCs.	**5**	**5**
3	**Output modules (5)** Discrete output module – TTL output module – Relay output – Isolated output module – surge suppression in output – Analog outputs – open collector output. Output Addressing scheme in important commercial PLCs.	**5**	**5**
4	**PLC Hardwares (6)** • Backplane & Rack, • Power Supply Module, Programmable Controller Network Interface Modules, Serial Communication Interface, Memory modules, Proprietary Cables & accessories, Introduction to Remote Input / outputs Redundancy - overview	**6**	**6**

5	**PLC Programming (18)** Symbols used – relays and logic functions – OR, AND, Comparator; Programming Devices – programming methods – STL and CSF, FBD and Ladder methods – simple instructions – Programming NC and NO contacts. EXAMINE ON and EXAMINE OFF instructions - online, offline methods– Latch and Unlatch outputs – pulse edge evaluation – timer instructions – on-delay and off-delay timer. Counter instructions – UP / DOWN counters – Timer and Counter applications. Program control instructions – Data manipulating instructions – Math instructions. converting simple relay ladder diagramm into PLC relay ladder diagram – PID and PWM functions. Sample PLC implementations for Automatic Star-Delta Starter and 4 - floor Lift system.	**18**	**17**
6	**Distributed Control System (DCS) (5)** Concept of DCS, Data Acquisition Basics, Data Control Basics DCS Architecture, Advantages & Limitations Overview of configuration & programming	**5**	**5**
7	**Supervisory Control & Data Acquisition (SCADA) (10)** • Introduction to SCADA • SCADA Architecture, Communication table for signal exchange, Introduction to communication protocols, Interfacing with PLC, Operating Screens, Application programming, Simulation / RUN time. **Networking** Levels of industrial control – types of networking – network communications – principles – transmission media – Field Bus – introduction, concepts, international field bus standards – Networking with TCP / IP Protocol – Network architecture – Physical addressing – LAN technologies – Ethernet – Token Ring – Sub-netting – subnet mask – transport layer – ports – sockets network services – file transfer protocol.	**10**	**12**
8	**Interface & bus standard: (5)** Interface and backplane bus standards for instrumentation systems. Field bus: Introduction, concept. HART protocol: Method of operation, structure, operating conditions and applications. Smart transmitters, IEEE 1451 protocol, smart valves and smart actuators.	**5**	**5**
		64	**70**

Laboratory Experiments (Any ten experiments)

1. Study of Various types of PLCs
2. Experiment to Control Stepper Motor using PLC
3. Experiment to Simulate Two Way Switch using PLC
4. Experiment to Control Motor from 3 different Position (1 ON & 2 OFF)
5. Experiment to toggle the functioning of two motors using PLC timer
6. Experiment to switch a pair of motors automatically in different sequence using PLC.
7. Experiment to control the level of water in a reservoir.
8. Security Alarm System Controlling
9. Experiment to Control the direction of rotation of a motor in Forward & Reverse direction using PLC
10. Developing Traffic Signal Control system using PLC
11. Controlling Solenoid valve using PLC
12. Controlling Pressure using PLC
13. Controlling Temperature using PLC
14. Controlling Flow of liquid using PLC

Text Books:

1. Programmable Logic Controllers -Principles and Applications, F John. W .Webb Ronald A Reis, Fourth edition, Prentice Hall Inc., New Jersey, 1998.
2. Distributed Control Systems, Lukcas M.P Van Nostrand Reinhold Co., New York, 1986.
3. Programmable Logic Controllers, Frank D. Petruzella Second edition, McGraw 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,	10	TWENTY	ONE	1X20 = 20	THREE	FIVE, TAKING AT LEAST ONE FROM EACH GROUP	TEN	10 X 5 = 50
B	4,5	6				THREE			
C	6,7,8	7				THREE			

EXAMINATION SCHEME (SESSIONAL)

1. **Continuous Internal Assessment of 50 marks** is to be carried out by the teachers throughout the Sixth Semester. **Distribution of marks: Performance of Job - 30, Laboratory Notebook- 20.**
2. External Assessment of 50 marks shall be held at the end of the Sixth Semester on the entire Sessional syllabus. One Drawing sheet from any one of the above is to be drawn.
   Distribution of marks: On spot job - 30, Viva-voce -20.

Name of the Course: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)*** Subject : ***Industrial Management***	
Course Code: ***EEIC/S6/IM***	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***100***
Teaching Scheme	**Examination Scheme**
Theory : 3 hrs./week	Mid Semester Exam.: **20 Marks**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **10 Marks**
Practical: -- hrs./week	End Semester Exam.: **70 Marks**
Credit: 3	Practical: **NIL**

Aim:

SI. No.	
1.	To study the techniques for improvement in productivity of the people and equipment, to plan the production schedule accordingly organize material supply for the manufacturing activities. To minimize the direct and indirect cost by optimizing the use of resources available. To learn accounting process, inventory control and process planning. Modern manufacturing system employ techniques such as JIT, TPM , FMS, 5'S', kaizen which should be known to the technician.

Objective:

SI. No.	The student will able to
1.	Familiarize environment in the world of work
2.	Explain the importance of management process in Business.
3.	Identify various components of management
4.	Describe Role & Responsibilities of a Technician in an Organizational Structure.
5.	Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician

Pre-Requisite: NIL

Contents (Theory)

Unit	Contents (Theory)	Hrs./Unit
	GROUP A	
1	***Overview Of Business*** 1.1. Types of Business • Service • Manufacturing • T rade 1.2. Industrial sectors	04

Unit	Contents (Theory)	Hrs./Unit
	Introduction to • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization • Introduction • Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.)	
2	***Management Process*** 2.1 What is Management? • Evolution • Various definitions • Concept of management Levels of management Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management Planning • Organizing • Directing • Controlling 2.4 Social responsibility and Environmental dimension of management]	05
	GROUP - B	
3	***Organizational Management*** 3.1 Organization :- • Definition • Steps in organization 3.2 Types of organization 1. Line 2. Line & staff 3. Functional 4. Project 3.3 Departmentation • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector	6
4	**Human Resource Management** 4.1 Personnel Management • Introduction • Definition • Objectives • Functions 4.2 Staffing • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel– Training & Development • Types of training	10

Unit	Contents (Theory)	Hrs./Unit
	• Induction • Skill Enhancement 4.4 Grievance handling 4.5 Leadership & Motivation • Maslow's Theory of Motivation 4.6 Safety Management • Causes of accident • Safety precautions 4.7 Introduction to – • Factory Act • ESI Act • Workmen Compensation Act • Industrial Dispute Act	
	GROUP - C	
5	***Financial Management*** 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts • Types of Budgets • Production Budget (including Variance Report) • Labour Budget • Different financial ratios, • Introduction to Profit & Loss Account (only concepts); Balance Sheet 5.4 Introduction to- • Excise Tax. • Service Tax • Income Tax • VAT • Custom Duty	9
6	**Materials Management** 6.1. Inventory Management (No Numerical) • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity(EOQ) 6.4 Stores function, Stores system, BIN card, Materials issue request(MIR), Pricing of materials • Introduction & Graphical Representation 6.4 Purchase Procedure • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management • Introductory treatment to JIT / SAP / ERP	9
7	**Safety Engineering** 7.1 Accidents-causes of accidents, Welfare measures. 7.2 Need for safety 7.3 Organization for safety 7.4 Safety committee 7.5 Safety programmes 7.6 Safety measures	5

Text Books:

Name of Authors	Title of the Book	Name of the Publisher
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpat Rai & sons New Delhi

V.Arun Viswanath, Anoop. S. Nair, S.L.Sabu	Industrial Engineering and Management	SCITECh Publication(s) Pvt. Ltd
A. Bhat & A. Kumar	Management Principles, Processes & Practices	Oxford University Press
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman, E. Kirby Warren, Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

Suggested List of Assignments/Tutorial :-

1. Preparation of financial budget of any organization.
2. Preparation of chart for fire safety.
3. Preparation of chart for personal, Tools & Equipments and products safety.
4. Preparation of chart to avoid accident.
5. Preparation of chart to show the different financial ratios.
6. Preparation of chart to show the different types of organization.

EXAMINATION SCHEME (THEORITICAL)

<table>
<tr><th rowspan="2">GROUP</th><th rowspan="2">UNIT</th><th colspan="4">ONE OR TWO SENTENCE ANSWER QUESTIONS</th><th colspan="4">SUBJECTIVE QUESTIONS</th></tr>
<tr><th>TO BE SET</th><th>TO BE ANSWERED</th><th>MARKS PER QUESTION</th><th>TOTAL MARKS</th><th>TO BE SET</th><th>TO BE ANSWERED</th><th>MARKS PER QUESTION</th><th>TOTAL MARKS</th></tr>
<tr><td>A</td><td>1, 2</td><td>7</td><td rowspan="3">TWENTY</td><td rowspan="3">ONE</td><td rowspan="3">1X20 = 20</td><td>THREE</td><td rowspan="3">FIVE, TAKING AT LEAST ONE FROM EACH GROUP</td><td rowspan="3">TEN</td><td rowspan="3">10X5 = 50</td></tr>
<tr><td>B</td><td>3, 4</td><td>7</td><td>THREE</td></tr>
<tr><td>C</td><td>5, 6, 7</td><td>11</td><td>FOUR</td></tr>
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Name of the Course: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)***	
Name of the subject: **Control of Electrical Machines (Elective)**	
Subject Code : ***EEIC/S6/CEM (EL)***	Semester: Sixth
Duration : One Semester	Maximum Marks : 150
Teaching scheme :	Examination scheme :
Theory: 3 Hrs./ Week	Mid Semester Exam: 20 Marks
Practical: 2 Hrs./Week	Assignment & Quiz: 10 Marks
	End Semester Exam: 70 Marks
	Practical: 50 Marks
Credit: 04	

Aim:	
SI. No.	
1.	This subject is the combination of Electrical machine and Control system. Most of the motor control circuits are based on these systems.
2.	Understanding of the subject will provide skill to the students of different motor control systems and their applications in industry.
Objective:	
SI. No.	Student will be able to:
1.	Interpret the basics of the motor control systems.
2.	Demonstrate the solid state control of motor.
3.	Describe the implementation of PLC in control systems.
Pre-Requisite:	
1.	Knowledge of Electrical machine.
2.	Knowledge of Control system.

Contents (Theory):		**Hrs./ Unit**	**Marks**
Unit: 1	1. Control Systems : 1.1 Concept of Automatic control system. 1.2 Illustration of Open loop and closed loop control system. 1.3 Need for feed back system. 1.4 Basic elements of a servo mechanism. 1.5 Examples of Automatic control system. 1.6 Introduction to solid state control. 1.7 Advantages of solid state control of machines.	08	12
Unit: 2	2. Magnetic Control Systems: 2.1 Operation & Applications of Contactor control circuit components - (i) Switches - Push button type, Selector type, Limit switch. Pressure, Float type, Proximity, Thermostat (Temperature) (ii) Fuses - Kit-kat type, Cartridge type. HRC type (iii) MCCB, MCB. (iv) Electromagnetic Contactor. (v) Overload relays - Voltage operated, Current operated, Thermal overload relay, Magnetic overload relay, (vi) Time delay relays (OFF delay, ON delay). (vii) Timer - Pnumatic type, Electronic type. (viii) Relays -Frequency response relay, Latching relay, Phase failure relay (single phase preventer), Solid state relay. (ix) Solenoid valve. 2.2 Principles of design of motor control circuits and power circuits.	10	14

Contents (Theory):		Hrs./ Unit	Marks
Unit: 3	3. MAGNETIC CONTROL OF DC MOTOR: 3.1 Operation of Control circuit & Power circuits| of - (i) Jogging operation of DC motor in one and two directions. (ii) Starters of DC motor - Current limit accleration starter, Series relay & Counter emf starter, Definite time accleration starter. (iii) Braking of DC motor - Dynamic braking , Reversing & plugging. (iv) Protection of DC motor - Field failure protection circuit, Field accleration protection circuit, Field deceleration circuit. 3.2 Solid State Control of DC Motor: (i) Speed control of DC motor using chopper circuit. (ii) Speed control of DC shunt motor using thyristor- Half-wave drives & Full-wave drives.	10	14
Unit: 4	4. MAGNETIC CONTROL OF AC MOTOR: 4.1 Operation of Control circuit & Power circuits of - (i) Reversing the direction of rotation of induction motor with Interlocking systems (ii) Simple ON-OFF motor control circuit, (iii) Automatic Sequencial control of motor. (iv) DOL starter, (v) Automatic Auto-transformer starter, (vi) Automatic Star-Delta starter. (vii) Starter for multispeed operation of motor. (viii) Plugging & Dynamic braking of AC motor. (ix) Protection of AC motor - Overload, Short circuit and Over temperature protection of high rating motors. 4.2 Solid State Control of AC Motor: (i) Speed control of three phase induction motor using variable voltage frequency control, (ii) Speed control of slip-ring induction motor using variable rotor circuit resistance. (iii) Speed control of single phase induction motor using thyristor. (iv) Speed control of synchronous motor. (v) Speed control of universal motor.	10	14
Unit: 5	5. Use of Programmable Logic Control (PLC): 5.1 Introduction & Advantages of PLC. 5.2 Function of each part of PLC. 5.3 Hardware of PLC. 5.4 Concept of Ladder diagram in PLC programming. 5.5 Ladder logic diagram for - (i) DOL starter of Induction motor, (ii) Automatic Star-Delta starter of Induction motor, (iii) Sequential operation of three motors with a time gap, (iv) Fluid filling operation. 5.6 Use of PLC in closed loop control, Proportional control, Integral control, Derivative control & PID control with illustration. 5.7 DC motor speed control using PLC programming.	10	16
	TOTAL	**48**	**70**

Practical:
Skills to be developed:
Intellectual Skills:
1. To select appropriate component and equipment.
2. Apply different designing skills.

Motor Skills:
1. Ability to draw the control & power circuit diagrams.
2. Ability to interpret the circuits and waveforms.
List of Practical: (At least Eight experiments are to be performed)
1. To study control components - Electromagnetic contactor, Thermal overload relay, Timer (OFF delay, On delay), Push button Switches, Solenoid valve, MCB.
2. To make & test the control and power circuit for Jogging operation, forward & reverse rotation of Sq.cage induction motor using contactor control.
3. To make & test the control and power circuit for fully-automatic star-delta starter operation of cage induction motor using contactor control.
4. To make & test the control circuit for dynamic braking operation of induction motor using contactor control.
5. To make & test the working of single phase preventer using contactor control.
6. To control speed of DC shunt motor using SCR drive.
7. To make & test the control circuit operation of DOL starter of induction motor using PLC.
8. To make & test the control circuit operation of automatic star-delta starter of induction motor using PLC.
9. To study the Speed control of DC shunt motor with PID control using PLC.
10. To make & test the control circuit operation of three sequential motor operations using PLC.

List of Text Books:

SI. No.	Name of Author	Title of the Books	Name of Publisher
1.	S.K.Bhattacharya	Industrial Electronics and Control	T.M.H.
2.	Dr. S.K.Sen	Electrical Machine	Khanna Publisher
3.	V. Subrahmanyam	Electric Drives - concepts & applications	T.M.Hill
4	Petruzella	Programmable Logic Controller	T.M.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	12	TWENTY	ONE	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO	TEN	10X5 = 50
B	4,5	11				FOUR	FROM EACH GROUP		

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 Sixth Semester. Distribution of marks: Performance of Job - 15. Laboratoiy Notebook - 10.
2. **External Assessment** of 25 marks shall be held at the end of the Sixth Semester on the entire Sessional 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: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)***	
Subject : ***INDUSTRIAL AUTOMATION (ELECTIVE)***	
Course Code: **EEIC/S6/IA(EL)**	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***150***
Teaching Scheme	**Examination Scheme**
Theory : 3 hrs./week	Mid Semester Exam.: **20 Marks**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **10 Marks**
Practical: 2 hrs./week	End Semester Exam.: **70 Marks**
Credit: 4	Practical: **50 Marks**

Aim:

The contents aim to develop the knowledge of the student in the field of automation in industries. This will be comprising knowledge of PLC, DCS and SCADA Systems. They will also get familiar with different industrial standard protocols.

Objective:

Sl. No.	The students will be able to:
1.	Know what automation is and what are the tools used in achieving automation.
2.	Program PLC.
3.	Know about the function of DCS, SCADA.
4.	Get acquainted with different standard protocols used in industries.

Pre-requisite:

Sl. No.	
1.	Idea on basic control system, basic electronics, digital electronics.
2.	Basic Concept in programming

Theory:

Unit	Contents	Hours	Marks
01	Control Systems and Automation Strategy: Evolution of instrumentation and control. Role of automation in industries, Benefits of automation. Introduction to automation tools PLC. DCS. SCADA, Hybrid DCS/PLC, Automation strategy evolution. Control system audit, performance criteria, Safety Systems.	6	8
02	Programmable logic controllers (PLC): Introduction, architecture, definition of discrete state process control, PLC Vs PC. PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, PLC design. Study of at least one industrial PLC.	10	16
03	Advance Applications of PLC and SCADA: PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC. PLC interface to SCADA/DCS using communication links (RS232. RS485) and protocols (Modbus ASCII RTU)	8	11
04	Instrumentation Standard Protocols: HART Protocol introduction, frame structure, programming, implementation examples. Benefits. Advantages and Limitations. Foundation Fieldbus HI introduction, structure, programming, FDS configuration, implementation examples. Benefits, Advantages and Limitations, Comparison with other fieldbus standards including Device net. Profibus. Controlnet. CAN. Industrial Ethernet etc.	8	11
05	Distributed Control Systems: DCS introduction, functions, advantages and limitations. DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control. Batch application. Historical Data Management, OPC support, Security and Access Control etc.	10	16
06	Automation for following industries - Power. Water and Waste Water Treatment, Food and Beverages. Cement, Pharmaceuticals, Automobile and Building Automation.	6	8
	TOTAL :	**48**	**70**

Contents (Practical)	
SI. No.	Skills to be developed
1.	Intellectual Skills: i) Analytical Skill ii) Identification skill
2.	Motor Skills: i) Operate different software used in industries used in automation, ii) Problem solving skill. iii) Proper Handling of PLC/DCS/SCADA system.

PRACTICAL:

01	Study of Various types of PLCs
02	Case study of Industrial PLC/PLC trainer.
03	Ladder diagram implementation of basic logic gates.
04	Ladder diagram implementation using timers.
05	Ladder diagram implementation using counters.
06	Ladder diagram implementation using relay sequencer.
07	Ladder diagram implementation for any one automation system.
08	Experiment on SCADA System.
09	Case study of Industrial DCS/DCS trainer.
10	Experiment on DCS Trainer for batch application, database management, and communication.
11	Interface of DCS with SCADA/PLC, using protocol/field bus.

BOOKS

Sl. No.	Title	Author	Publication
01	Distributed Computer Control for Industrial Automation	Poppovik Bhatkar	Dekkar Publications
02	Programmable Logic Controllers: Principles and Applications	Webb and Reis	PHI
03	Computer Aided Process Control	S.K. Singh	PHI
04	Introduction to Programmable Logic Controllers	Garry Dunning	Thomson Learning
05	The Management of Control System: Justification and Technical Auditing	N.E.Battikha	ISA
06	Computer Based Process Control	Krishna Kant	PHI

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	10 (TEN)	10 X 5 = 50
B	4, 5, 6	11				FIVE			

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: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)*** Subject : ***Computer Hardware and Networking (Elective)***	
Course Code: **EEIC/S6/CHN(EL)**	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***150***
Teaching Scheme	**Examination Scheme**
Theory : 3 hrs./week	Mid Semester Exam.: **20**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **10**
Practical: 2 hrs./week	End Semester Exam.: **70**
Credit: 4	Practical: **50 Marks**

Aim:

SI. No.	
1.	To Identify various components of PC
2.	To study construction, working and function of different peripheral devices.
3.	To study Networking basic and know how to set up Local Area Network
Objective:	
SI. No.	
1.	• Identify various components of PC.
2.	• Describe the construction, working and function of different peripheral devices.
3.	• Read and interpret documentation .
4.	• Assemble the PC and connect the modules.
5.	• Install system software, application software and drivers.
6.	• Set up Local Area Network.
Pre-Requisite:	
SI. No.	
1.	Digital Electronics
2.	

Contents (Theory)		**Hrs./Unit**	**Marks**
Unit: 1	Introduction: PC system units - Front Panel / Rear side connectors, switches and indicators -specification parameters - Lap top PCs - Palm top PCs.	02	04
Unit: 2	Inside PC 2.1 Inside PC - functional blocks of mother board - CPU, RAM, BIOS, Cache RAM, BUS extension slots, on-board I/O and IDE connectors PCI, AGP & PCI express. 2.2 BIOS, services, organization and interaction. 2.3 CMOS, CMOS setup utilities, CMOS setup program. 2.4 Motherboard types. 2.5 Processors - CISC and RISC. 2.6 Features of Pentium 4 processor, Pentium Celeron processor, CYRIX series processors, AMD series processors. 2.7 Chipsets - features of Intel 854, 915 series chipset motherboards 2.8 Bus standard and Bus architecture 2.9 Power supplies -SMPS for Computers, Power requirements in PCs.	12	16
Unit: 3	On board memory, I/O interface and storage device 3.1 PC's memory organization 3.2 ROM, RAM, distinguish between static and dynamic RAM 3.3 DRAM, Synchronous DRAM, Cache Memory, Extended/ Expanded/Virtual memory. 3.4 I/O port - Serial port, Parallel port, USB port 3.5 Hard disk drives : Functional block diagram, SATA technology. 3.6 CD-ROM drive - Principle of operation, block diagram. 3.7 DVD technology - DVD disks, DVD drive, block diagram.	05	8

Contents (Theory)		**Hrs./Unit**	**Marks**
	3.8 Pen drives.		
Unit: 4	Input and Output Devices 4.1 Keyboard - types, operation, and keyboard signals, interface logic, keyboard functions. 4.2 Mouse - principle of operation, mouse signals, optical mouse, mouse installation. 4.3 Scanner - principle of operation, types. 4.4 Digital display technology (thin displays) - Liquid crystal displays, Plasma displays, TFT monitors. 4.5 Modem: Introduction - functional block of modem - working principle - types - installation. 4.6 Dot matrix printer - principle of operation. 4.7 LASER printer - principle of operation 4.8 Ink-jet printer- principle of operation, 4.9 Plotter - types, functional block diagram.	05	7
Unit: 5	Computer Network Basics: Introduction - OSI layer model - Function of each layer network types - LAN- WAN- MAN - internet - intranet - extranet - Blue tooth Technology. TCP/IP: Introduction, History of TCP/IP, Function of each layer of TCP/IP, User Datagram Protocol, Comparison of OSI and TCP/IP. IP Addressing, IP address classes, Subnet Addressing, Domain Name System, Email - SMTP, POP,IMAP; FTP, FITTP, Overview of IP version 6.	12	16
Unit: 6	Network Media& Hardware Twisted wire - Coaxial cable - fiber optic cable, VSAT Local Area Network: Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN topologies - star - ring - mesh - bus - Client/Server - peer to peer. IEEE 802 standards, Ethernet, LAN interconnecting devices: Flubs, Switches, Bridges, Routers, Gateways.	08	12
Unit: 7	Cryptography : Encryption, Decryption, Asymmetric Key and Symmetric Key Cryptography, Digital Signature.	04	7
	TOTAL	48	70

Contents (Practical)	
SI. No.	Skills to be developed
1.	Intellectual Skills: i) Identify various components of Computer ii) Able to prepare a block diagram to correlate all the components based on their functions
2.	Motor Skills: i) Able to use the various tools efficiently ii) Able to set Local Area Network.

List of Laboratory Experiments:	
SI. No.	Laboratory Experiments
1.	Connecting & disconnecting computer peripherals and components & driver installation (For example Printer/Modem/DVD/Scanner etc.)
2.	To carry out Hard disk partitioning and formatting.
3.	To install operating System like Windows 7 / Linux (Ubuntu)
4.	To change the Standard settings and advanced settings (BIOS and Chipset features) of CMOS set up Program.
5.	To install the Network Interface Card and Familiarize with 0 Networking cables (CAT5, UTP) o Connectors (RJ45, T-connector) o Hubs, Switches

6.	To carry out Straight Through and Cross Over Cable connection with RJ 45 and CAT 5 cable
7.	To set up a Local area Network with 5 nos. of computers.
8.	To share Printer, Folder and Drives.

Text Books:			
Name of Authors	Title of the Book	Edition	Name of the Publisher
Vikas Gupta	Hardware and Networking Course Kit		Dreamtech Press
Steve Rackley	Networking in easy steps		Dreamtech Press
Behrouz A. Forouzen	Data communication and Networking		Tata Me. Graw-Hill Publishing Co. Ltd.
D Bala Subramanian	Computer Installation and Servicing		TMH, New Delhi
Mike Meyers, scott Jernigan	Managing and troubleshooting PCs		TMH, New Delhi
Bhushan Trivedi	Computer Network		Oxford University Press

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	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10X5 = 50
B	5,6,7	11				FOUR			

EXAMINATION SCHEME (SESSIONAL)

1. Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Sixth Semester. Distribution of marks: Performance of Job - 15, Laboratory Notebook - 10.
2. External Assessment of 25 marks shall be held at the end of the Sixth Semester on the entire Sessional 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: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)***	
Subject : ***Industrial Project***	
Course Code: **EEIC/S6/IP**	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***100***
Teaching Scheme	**Examination Scheme**
Theory : -- hrs./week	Mid Semester Exam.: **NIL**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **NIL**
Practical: 4 hrs./week	End Semester Exam.: **NIL**
Credit: 2	Practical: **100 Marks**

Aim:

SI. No.	
1.	This subject is intended to teach students to understand facts, concepts and techniques of electrical equipments, its repairs, fault finding and testing, estimation of cost and procurement of material, fabrication and manufacturing of various items used in electrical field
2.	This will help the students to acquire skills and attitudes so as to discharge the function of supervisor in industry and can start his own small-scale enterprise

Objective:

SI. No.	
1.	• Develop leadership qualities.
2.	• Analyze the different types of Case studies.
3.	• Develop Innovative ideas.
4.	• Develop basic technical Skills by hands on experience.
5.	• Write project report.
6.	• Develop skills to use latest technology in Electrical field.

Pre-Requisite:

SI. No.	
1.	Knowledge of subjects up to 5th Semester of Electrical Engineering
2.	

Contents

This subject is the continuation of the part of Industrial Project of subject **"INDUSTRIAL PROJECT AND ENTREPRENEURSHIP DEVELOPMENT "** studied in 5th Semester. Following activities related to project
are required to be dealt with, during this semester.

1) Each project batch should carry out the actual Project works which have been approved in Fifth Semester.
2) At the end of this semester each project batch should prepare the detailed project report & submit the same to respective guide.

The lists of projects are same as in 5th semester which are as follows:

Group	***Projects***
I	1. Design of Illumination Scheme (Up to 20 KW) for Hospital / Shopping Mall / Cinema Theatre / Commercial Complex / Educational Institute / Industrial Complex. 2. Design of Rural Electrification Scheme for small Village, Colony. 3. Energy Conservation and Audit. 4. Substation Model (Scaled) 5. Wind Turbine Model (Scaled) 6. Pole Mounted Substation Model (Scaled) 7. Conduct load survey to ascertain the total load requirements of a locality/olytechnic. 8. Any other items as may be assigned by the teacher concerned.
II	(1) Rewinding of Three Phase/Single Phase Induction Motor. (2) Rewinding of Single Phase Transformer. (3) Fabrication of Inverter up to 1000 VA.

Group	*Projects*
	(4) Fabrication of Battery Charger. (5) Fabrication of Small Wind Energy System for Battery Charging. (6) Fabrication of Solar Panel System for Battery Charging. (7) Fabrication of Water level controller. (8) Fabrication of DC motor speed control circuit by SCRs. (9) Microprocessor/ Micro controller Based Projects. (10) Simulation Projects using Matlab. (11) Any other items as may be assigned by the teacher concerned.

Continuous Internal Assessment of 50 marks is to be carried out by the teachers throughout the semesters. **Distribution of marks: Project Work – 25, Project Report Presentation – 15, Viva-voce – 10.**

External assessment of 50 marks shall be held at the end of the Sixth Semester on the entire Project Work. The external examiner is to be from Industry / Engineering College / University / Government Organization. **Distribution of marks:** Project Work - 25, Project Report Presentation – 15, Viva-voce – 10.

Name of the Course: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)***	
Subject : ***Professional Practices IV***	
Course Code: ***EEICS/S6/PF IV***	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***50***
Teaching Scheme	**Examination Scheme**
Theory : -- hrs./week	Mid Semester Exam.: **NIL**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **NIL**
Practical: 3 hrs./week	End Semester Exam.: **NIL**
Credit: 2	Practical: **50 Marks**

Aim:

SI. No.	
1.	To acquire information from different sources
2.	To present a given topic in a seminar, discuss in a group discussion
3	To prepare report on industrial visit, expert lecture.

Objective:

SI. No.	The student will be able to
1.	Acquire information from different sources
2.	Prepare notes for given topic
3.	Present given topic in a seminar
4	Interact with peers to share thoughts
5	Prepare a report on industrial visit, expert lecture

Pre-Requisite:

SI. No.	
1.	Knowledge of studying 5 semesters in Diploma Engineering

Activities

Sr. No.	Activities	Hours
1.	***Industrial / Field Visit:*** Structured Field visits be arranged and report of the same should be submitted by the individual student, to form part of the term work. Visits to anv ONE from the list below (should not have completed in earlier semester): i. Multistoried building for power distribution ii. Any industry with process control and automation iii. District Industries Centre (to know administrative set up, activities, various schemes etc) iv. Railway / metro railway signaling system v. Motor rewinding in a motor rewinding shop vi. Visit warehouse / Rail yard / port and observe Material Handling Management & documentation. vii. A thermal / Hydel power generating station viii. A Wind mill and / or Hybrid power station of wind and solar ix. An electrical substation x. A switchgear manufacturing / repair industry xi. Protection system in a large industry. xii. Visit to maintenance dept of a large industry. xiii. A large industry to study protection system xiv. Industry of power electronics devices xv. Transmission tower project area xvi. Any contemporary industry under MSME sector to understand detail of operation and starting of a new venture. xvii. A large industry to study protection system xviii. Industry of power electronics devices xix. Transmission tower project area	12

Sr. No.	Activities	Hours
	xx. Any contemporary industry under MSME sector to understand detail of operation and starting of a new venture. xxi. Any other technical field area as may be found suitable alternative to above list.	
2	***Guest Lecture by professional / industrial expert:*** The guest lecture (s) any three of two hours duration each from the field /industry experts, professionals or from experienced faculty members(from own department or other departments) will be encouraged) are to be arranged from the following or alike topics. A brief report to be submitted on the guest lecture by each student as a part of term work. **Group A (at least one)** i. Career opportunities for diploma engineers ii. ii)Industrial Dispute and Labour Laws iii. Challenges in industrial working environment for diploma engineers iv. Scope for diploma electrical engineers v. Working in shopfloor. vi. Oppurtunities in the service sector vii. Any other topic of relevance as may be deemed fit for fresh engineers viii. as he starts his career in industry. **Group B (at least one)** i. Eco friendly air conditioning / refrigeration. ii. Modern trends in AC machine iii. Testing of switchgear iv. Biomedical instruments – working, calibration etc. v. Automobile pollution, norms of pollution control. vi. Nanotechnology vii. Modern techniques in Power Generation viii. New trends in power electronics devices ix. TQM x. Recent modification in IE rules xi. standardization / ISO certification xii. Role of micro, small and mediun enterprise. In Indian economy. xiii. Entrepreneurship development and oppurtunities xiv. Interview techniques xv. Any topic that could not be covered in earlier semesters and having relevance to technical knowledge gathered in all semesters.	12
3	***Information search*** Information search can be done through manufacturers, catalogue, internet, magazines, books etc and a report need to be submitted. Can be done in a group of 2/3 students Topic suggested (any two)Teachers may assign work on any other cross disciplinary subjects for enrichment of knowledge outside course work of Electrical discipline) 1. Blue tooth technology 2. Artificial technology 3. Data warehousing 4. Cryptography 5. Digital signal processing 6. Bio-informatics 7. Magnetic levitation system 8. Recent development in electrically operated vehicles for mass transport 9. Comparative study of metro railway in Kolkata and Delhi 10. Alternative fuel and energy options 11. Comparison of transformer companies 12. Latest trends in classification of insulating materials 13. Design consideration for dry type transformers 14. State and national statistics of power generation	12

Sr. No.	Activities	Hours
	15. Market survey of contactors, relays and their comparative analysis. 16. Market survey of any other electrical product which must include among other things various manufacturers, cost, specification, application areas etc.	
4	***Group Discussion*** The students should discuss in a group of six to eight students. Each group to perform any TWO group discussions. Topics and time duration of the group discussion to be decided by concerned teacher. Concerned teacher may modulate the discussion so as to make the discussion a fruitful one. At the end of each discussion each group will write a brief report on the topic as discussed in the group discussion. Some of the suggested topics are – i. Scope of outsourcing of electrical Engineering services. ii. ii)Pollution Control iii. Rain water harvesting iv. Trends in energy conservation v. Safety in day to day life vi. Use of plastic carry bag (social & domestic Hazard) vii. vii)Pollution control viii. viii) Any other common topic related to electrical field as directed by concerned teacher.	14
5	***Seminar / Poster presentation:*** Students should select a topic for seminar based on recent development in Electrical Engineering fields, emerging technology etc. Concerned Teachers will guide students in selecting topic.	14

EXAMINATION SCHEME (SESSIONAL)

Continuous internal assessment of 50 marks is to be carried out by the teachers throughout the sixth semester. **Distribution of marks: Information search = 10, seminar = 10, Group discussion = 5, field visit = 10, guest lecture attendance and report = 15**

Name of the Course: ***DIPLOMA IN ELECTRICAL ENGINEERING (INDUSTRIAL CONTROL)*** Subject : ***General Viva Voce***	
Course Code: ***EEIC/S6/GVV***	Semester: ***SIXTH***
Duration: ***ONE SEMESTER***	Maximum Marks: ***100***
Teaching Scheme	**Examination Scheme**
Theory : -- hrs./week	Mid Semester Exam.: **NIL**
Tutorial: -- hrs./week	Attendance, Assignment & interaction: **NIL**
Practical: -- hrs./week	End Semester Exam.: **NIL**
Credit: 2	Practical: **100 Marks**

Aim:

Sl. No.	
1.	It is required to revisit the contents of the departmental subjects learnt by the students up to sixth semester.
2.	As a diploma holder of Electrical Engineering, students should be able to co relate the various ideas and concepts learnt from various subjects throughout the course duration.
3.	Student should equip themselves to face various types of technical questions during various competitive examinations/ Interview Board.

Contents (Theory)

The syllabi of all the theoretical and sessional subjects taught in the three years of diploma education

EXAMINATION SCHEME (SESSIONAL)

The Final Viva-Voce Examination shall take place at the end of Sixth Semester. It is to be taken by Faculty members of the Institute concerned.