CURRICULAR STRUCTURE FOR PART- II (2ND YEAR) OF THE FULL TIME DIPLOMA COURSES IN ENGINEERING AND TECHNOLOGY

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME: FULL TIME Diploma in Instrumentation and Control Engineering

DURATION OF COURSE: 6 SEMESTERS

SEMESTER: FOURTH

BRANCH: ENGINEERING

SR. NO.	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR	@TW	Total Marks
						TA	CT	Total				
1.	Process Instrumentation I	3	3	1	-	10	20	30	70	-	-	100
2.	Process Control	3	3	-	-	10	20	30	70	-	-	100
3.	Digital Electronics	3	3		-	10	20	30	70	-	-	100
4.	Applied Electronics I	3	3			10	20	30	70	-	-	100
5.	Electronic Measuring Instruments	2	2			5	10	15	35			50
6.	Process Instrumentation I Laboratory	3			3					100		100
7.	Digital Electronics Laboratory	2	-	-	3	-	-	-	-	50	-	50
8.	Applied Electronics Laboratory	2	-	-	3	-	-	-	-	50	-	50
9.	Programming In C	2	1		2					50		50
10.	Development of Life Skill-I	1	-	-	2	-	-		-	50	-	50
11.	Professional Practice – II	1			2						50	50
12.	Disaster Management	1	2	-	-	-	-	-	-	-	50	50
	Total	26	17	1	15	45	90	135	315	300	100	850

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

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

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

TA (Teacher's assessment) = 10 marks: Attendance & surprise quizzes = 5 marks and Assignment & group discussion = 5 marks for CT= 20 Marks.

TA (Teacher's assessment) = 5 marks: Attendance & surprise quizzes + Assignment & group discussion = 5 marks for CT = 10 Marks.

Environmental Studies is a non credit based subject and only internal theoretical examination of 50 marks will be conducted.

Total Marks : 850

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

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

Syllabus for PROCESS INSTRUMENTATION - I

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Process Instrumentation I**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 100

Teaching Scheme:
    Theory : 3hrs/week
    Tutorial : 1hrs/week
    Practical : 3hrs/week
	Examination Scheme:
	    Internal Scheme : Teachers Assessment: 10
	                              Class Test : 20
	    End Semester Exam : 70

Credit: 4	

Aim:

Sl No.	
1	To control process parameters, precise measurement of those is the most important part.. The subject deals with measurement principles and techniques of process parameters like force, pressure etc
2	To study signal conditioning, signal transmission, and storage for analysis & control

Objective:

Sl No.	The Student will able to
1	Know the principle of operation, advantages, disadvantages of different process parameter like force, pressure, strain etc
2	Choose the proper measuring sensor/ instrument for specific measurement
3	Compare the different instruments used for a specific operation
4	Know the specification of different measuring instruments
5	Identify signal conditioning circuit for Instrumentation system in Industrial process, measurement & control
6	Know basic idea on signal transmission in Instrumentation system
7	Know the principle and application of different proximity sensors

Pre-requisite:

Sl No.	
1	Fundamental idea of Instrumentation system
2	Basics of electronics
3	Basics of physics

		Contents	
Module	**Chapter**	**Name of the topics**	**Hrs / Module**

A	1	**Proximity Sensors:**
		    1.1 Definition and importance of proximity sensors in instrumentation field
		    1.2 Description & application of different types of proximity sensors such as Inductive, optical, magnetic, capacitive, ultrasonic types
			7

	2	**Strain Gauge & Load Cell:**
		    2.1 Material of construction of strain gauge, classification, gauge factor, strain measuring circuit, dummy strain gauge, advantage, disadvantage and application of various types of strain gauge, advantage of semiconductor strain gauge over metallic strain gauge.
		    2.2 Load cell- column type, shear type, application of load cells in industries.
			9

	3	**Pressure Measurement:**
		    3.1 Definition, classification & units of pressure. Relation between different units
		    3.2 Manometer : U tube, well type & micrometer
		    3.3 Elastic pressure sensor: bourdon tube, bellow, diaphragm, capsule.
		    3.4 Vacuum measurement using Mc Leod gauge, Thermal conductivity gauge, Ionization gauge, Pirani gauge
		    3.5 Dead Weight Tester
		    3.6 Calibration of pressure measuring instruments by manometer & dead weight tester
		    3.7 Flapper- Nozzle system for pressure measurement
			12

	4	**Signal Conditioning**	11
B		4.1 Relevance of signal conditioning in process instrumentations.	
		4.2 Principles of analog signal conditioning. Brief idea on signal level & bias changing, linearization, conversions, filtering & impedance matching. Concept of loading	
		4.3 Passive signal conditioner: voltage divider, Wheatstone bridge circuit, RC filter	
		4.4 Active signal conditioner: Idea on op amp based circuit	
		4.5 I/P, P/I, I/V, V/I, F/V, V/F converters.	
		4.6 Instrumentation Amplifier, Charge amplifier, & their importance,	
	5	**Data Processing**	11
		5.1 Necessity of data processing in Instrumentation	
		5.2 Block diagram and explanation of a generalized Data Acquisition System	
		5.3 Objective of DAS	
		5.4 Signal Conditioning in DAS, Radiometric conversion, Logarithmic conversion	
		5.5 Single channel and multichannel DAS	
		5.6 Block diagram explanation, characteristics of Data Logger	
		5.7 Comparison between DAS and Data Logger	
	6	**Data Transmission & Telemetry**	10
		6.1 Idea on pneumatic & electric transmission	
		6.2 General Telemetry system	
		6.3 Voltage, current, & position telemetry system	
		6.4 4-20 mA current transmission, live and dead zero.	
		6.5 Need for modulation & demodulation in signal transmission	
		6.6 Basic idea on amplitude & frequency modulation (no deduction)	
		6.7 Need of Multiplexer in data transmission, Explanation of TDM & FDM	
		6.8 Idea on analog and digital data transmission	
		6.9 Advantage and disadvantage of digital data transmission over analog data transmission	

Books:

Title	Author	Publisher
Introduction to Measurement & Instrumentation	Ghosh	PHI
Principles of Industrial Instrumentation	D.Patranabis	TMH
Measurement System Application & Design	E.O.Doeblin	Mc Graw Hill
Instrument Engineers' Handbook, Vol I: Process Measurement & Analysis	Bela G. Liptak	CRC Press, Taylor & Francis
Instrument Transducer	H K P Neubert	Oxford University Press
Mechanical Measurements	Beckwith, Buck & Marangoni	Narosa Pub. House
The Essence of Measurement	Allan Morris	PHI
A Course in Electrical & Electronics Measurement & Instrumentation	J.B. Gupta	S. K. Kataria Pub. Co.
Industrial Instrumentation & Control	S K Singh	TMH
Sensors & Transducers	D. V. S. Murty	PHI
Instrumentation & Control	Reddy, P S R Krishnudu	Scitech
Handbook of Modern Sensors	Fraden, Jacob	Springer

End Semester Examination Scheme

Maximum Marks: 70					Time: 3 Hrs			
Group	**Module**	**Objective 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	12	Any 20	1	1 x 20 =20	4	Any 5 taking at least 2 from each group	10	10 x 5 =50
	2								
	3								
B	4	13				4			
	5								
	6								

Note: Above syllabus is same as that of Diploma in Electronics & Instrumentation Engineering(4ᵗʰ Semester)

Syllabus for PROCESS CONTROL

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Process Control**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 100

Teaching Scheme:
   Theory : 3 hrs/week
   Tutorial :
   Practical:
	Examination Scheme:
	   Internal Scheme : Teachers Assessment: 10
	                                Class Test : 20
	   End Semester Exam : 70

Credit: 4	

Aim:

Sl No.	
1	Monitoring and control of process is the most important part of in industry. With knowledge of this subject students will be able to control the process parameter as per the desired value for the optimization of the process.

Objective:

Sl No.	The Student will able to
1	Know basics of process and control system
2	Define the mathematical equation from physical system for further analysis
3	Analyze the stability of the system
4	Perform time response analysis of different system
5	Know the control loop with different pneumatic & electronic controller
6	Test , calibrate, maintain process control elements
7	To know use of controllers and control valves

Pre-requisite:

Sl No.	
1	Fundamental idea on instrumentation
2	Knowledge of mathematical calculation
3	Knowledge of basic Electronics

Contents			
Module	**Chapter**	**Name of the topic**	**Hrs / Module**

A	01	**Introduction to process and feedback control systems**:
		  1. Concept of process.
		  2. Classification of process variable.
		  3. Concept of open loop and closed loop control system.
		  4. Feedback – negative and positive, merits and demerits.
			6

	02	**Frequency response analysis**:
		  1. Concept of frequency response.
		  2. Concept of resonance frequency, resonant peak, cut off frequency and band width.
		  3. Different techniques used for stability analysis in frequency domain (only names).
			12

	03	**Bode Plots:**
		  1. Concept of Bode plot.
		  2. General procedure for constructing Bode plot.
		  3. Simple Bode plotting on semi-log papers.
			12

	04	**Basic Control Schemes and Controllers:** 4.1 A basic close loop control system and its working 4.2 Function and explanation of following control actions: On-Off, P, PI,PD, PID, Their relative merits and demerits. 4.3 Explanation & transfer function of On-Off, P, PI, PD, & PID type pneumatic controller (only motion balance type). 4.4 Explanation & transfer function of On-Off, P, PI, PD, & PID type electronic controller	15
B	05	**Final Control Element:** 5.1 Different types of On Off and regulating Control Valve 5.2 Different parts of a Globe valve 5.3 Valve actuator 5.4 Explanation and use of I/P converter, positioned, Air Filter Regulator, Purge Regulator (constatnt DP regulator) 5.5 Idea on Control valve Characteristics, Cv, value selection & sizing , cavitation, flashing, rangeability 5.6 Specification of Control Valve 5.7 Installation of Control valve with manifolds. 5.8 Operation of SDV, ESDV, solenoid valve, MOV, Safety valve (pressure, temperature), self actuated Pressure Control Valve. 5.9 Basics of valve signature. 5.10 Construction, working principle and application of Servo Motor & Stepper motor	15

Books:

Title	Author	Publisher
Process Control Principle & Application	S Bhanot	Oxford University Press
Process Control; Concept Dynamics & Application	S. K. Singh	PHI
Principles of Process Control	D.Patranabis	Mc Graw Hill
Instrument Engineers' Handbook: Process Control & Optimization, Vol-II	Bela G Liptak	CRC Press, Taylor & Fraancis Group
Chemical Process Control: An Introduction to Theory & Practice	Stephanopoulos	Pearson
Instrumentation Fundamental for Process Control	D.O.J.Desa	Taylor & Francis
Modern Control Engineering:	K.Ogata	PHI
Principles of Industrial Process Control	D.P.Eckman	J. Wiley & Sons
Automatic Process Control	D.P.Eckman	J. Wiley & Sons
Nice's Control System Engineering	Gupta	Wiley India
A course in modern control system	Saurab Mani Tripathy	Laxmi Publications
Automatic control systems with MATLAB programing	Beniwal	Laxmi Publications
Process Control Instrumentation Technology	Curtis Johnson	PHI
Automatic Control System	Kuo	Wiley India
Modern Control System	Ogata	PHI
Control System Theory	S Dasgupta	Khanna
Process System Analysis & Control	Coughanowr	Mc Graw Hill International

End Semester Examination Scheme

Maximum Marks: 70					Time: 3 Hrs			
Group	Module	**Objective 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	13	Any 20	1	1 x 20 =20	4	Any 5 taking at least 2 from each group	10	10 x 5 =50
	2								
	3								
B	4	12				4			
	5								

Syllabus for DIGITAL ELECTRONICS

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Digital Electronics**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 100

Teaching Scheme:
    Theory : 3hrs/week
    Tutorial : 1hrs/week
    Practical : 2hrs/week
	Examination Scheme:
	    Internal Scheme : Teachers Assessment : 10
	                                      Class Test : 20
	    End Semester Exam : 70

Credit: 4	

Aim:	
Sl No.	
1	To study different logic families
2	To introduce different logic gates, Boolean algebra & combinational logic design using those gates
3	To learn how to design sequential logic using flip flop

Objective:	
Sl No.	The Student will able to
1	Design simple logic circuits
2	Assemble logic circuits
3	Observe outputs of logic circuits
4	Troubleshoot digital circuits

Pre-requisite:	
1	Basic Physics
2	Electronics Engineering

Contents			
Group	**Module**	**Name of the topic**	**Hrs / Module**
A	01	**Number Systems & Code:** 1.1 Binary, octal, decimal & hexadecimal number systems, conversion from one system to another system. 1.2 Binary arithmetic, signed numbers, subtraction using 1's & 2's complement representation, concept of over flow. 1.3 Code- BCD, alphanumeric, ASCII. 1.4 Concept of parity & error correction.	6
	02	**Boolean Algebra & Logic Gates:** 2.1 Logical symbol, logical expression and truth table of AND, OR, NOT, NOR, NAND, XOR, XNOR, 2.2 Use of NAND & NOR gates as universal gates, implementation of Boolean functions using logic gates, circuit of logic gates using discrete components. 2.3 Digital logic families- RTL, TTL & CMOS, characteristics & circuit configurations, open collector & tri state gates 2.4 Boolean algebra law postulates, Duality Theorem, De Morgan's Theorem.	9

	03	**Combinational Logic Circuits:**	11
		3.1 Boolean functions & standard canonical forms, simplification using Boolean algebra & K- map, Minimization of logical expression using K-map (2, 3, 4 variables), POS & SOP	
		3.2 Truth Table, K –map, simplified logical expression and logical circuit of Half Adder & Full Adder, Half Subtractor & Full Subtractor.	
		3.3 Block diagram and Truth Table of Encoders, priority Encoder ICs and Decoder, Decoder-Driver	
		3.4 Block diagram, Truth Table, working principle, Application, PIN functions of Decimal to BCD Encoder (IC 74147) and BCD to & Segment Decoder	
B	04	**Multiplexers & Demultiplexers:**	7
		4.1 Block Diagram, Truth Table, Logical Expression and Logic Diagram of Multiplexer (4:1 and 8:1), Design of 8:1 using 2 4: 1 Mux, Multiplexer ICs	
		4.2 Block Diagram, Truth Table, Logical Expression and Logic Diagram of Demultiplexer (1:4, 1:8, 1:16), Demultiplex ICs	
B	05	**Flip Flops & Sequential Logic Design:**	13
		5.1 Symbol, logic diagram using NAND/NOR gates , working and Truth Table of S R flip flop	
		5.2 Symbol, logic diagram using NAND gates , working, Truth Table and timing diagram of clocked S R flip flop	
		5.3 Concept of edge triggering, level triggering	
		5.4 Symbol, logic diagram using NAND gates , working, Truth Table and timing diagram of clocked J K flip flop	
		5.5 Block diagram and Truth Table of Master-slave J K flip flop	
		5.6 Symbol, working and Truth Table of D & T flip flop	
		5.7 Application of flip flops	
		5.8 Working, truth table, & timing diagram of Synchronous Counters (3 bit), Asynchronous Counter (3 bit, 4 bit), Mod N Counter, synchronous, up, down, up down, binary, decade, divide by N, ring counter.	
		5.9 Block diagram, Working, Truth Table and waveform of Shift registers- SISO, SIPO, PISO, PIPO (4 bit) and universal Shift register.	
		5.10 Application of Counter & Registor	
	06	**A/D & D/A Converters:**	9
		6.1 Block diagram and working of Ramp type, dual slope type, SAR type Flash type A/D converter,	
		6.2 Specifications of A/D converter.	
		6.3 Circuit diagram and working of R-2R ladder DAC & Weighted resistor D/A converter, Their comparison.	
		6.4 Specifications of D/A converter	
	07	**Timing Circuits:**	5
		7.1 Block diagram & Pin diagram of 555 IC Timer	
		7.2 Working of 555 timer as astable multivibrator	
		7.3 Working of 555 times as monostable multivibrator	

Books:		
Title	**Author**	**Publisher**
Digital Principles	R.P. Jain	Mc Graw Hill
Fundamentals of Digital Circuits	A Anand Kumar	PHI
Digital Electronics	A.K. Maini	Wiley India
Digital Electronics	G K Kharate	Oxford University Press
Digital Circuits & Systems	Hall	Mc Graw Hill Pub. Co

Digital Principles & Applications	Malvino & Leach	Mc Graw Hill Pub. Co
Digital System Design	Morris Mano	PHI
Switching Theory & Logic Design	C. V. S. Rao	Pearson
Digital Electronics	S. P. Bali	Mc Graw Hill
Digital Circuit -Vol I	D. Ray Chaudhury	Platinum Publisher
Digital Circuit -Vol II	D. Ray Chaudhury	Platinum Publisher
Digital Integrated Electronics	H. Taub, D. Shilling	Mc Graw Hill
Digital Fundamentals	Floyed, Jain	Pearson
Digital Electronics	P. Raja	Scitech
Digital Circuit & Design	S. Aligahanan, S. Aribazhagan	Bikash Publishing
A Text Book of digital Electronics	R S Shedda	S Chand & Company Ltd

End Semester Examination Scheme

| Maximum Marks: 70 | | | | | Time: 3 Hrs | | | |

Group	Module	**Objective 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	12	Any 20	1	1 x 20 =20	3	Any 5 taking at least 2 from each group	10	10 x 5 =50
	2								
	3								
B	4	13				5			
	5								
	6								
	7								

Note: Above syllabus is same as that of Diploma in Electronics & Instrumentation Engineering(4th Semester)

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Electronic Measuring Instruments**	
Course Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 50

Teaching Scheme:
    Theory : 2 hrs/week
	Examination Scheme:
	    Internal Scheme : Teachers Assessment : 05
	                                   Class Test : 10
	    End Semester Exam : 35

Credit: 2	

Aim:	
Sl No.	
1	The subject knowledge is required to provide detail knowledge for proper handling of electronic instruments which are widely used in electronics laboratory & electronics workshops.
2	Understanding the subject will provide skill to the students for trouble shooting & testing of circuits using instruments

Objective:	
Sl No.	The Student will able to
1	Know different analog and digital measuring instruments
2	Know about the digital frequency meter
3	Explain the operation of CRO and Function Generator
4	get an idea regarding the maintenance & service of these instruments

Pre-requisite:	
Sl No.	
1	Idea on basic analog and digital electronics
2	Idea on active and passive components

Contents			
Group	**Module**	**Name of the topic**	**Hrs/ Module**

A	1	**Different Measuring Instrument**
		    1.1 Comparison between analog & digital measuring instrument
		    1.2 Rectifier type, True RMS type analog voltmeter.
		    1.3 Ramp type and dual slope integrating type DVM
		    1.4 Q Meter- application & error.
			10

	2	**Frequency & Power Measurement**
		    2.1 Name of different frequency meter
		    2.2 Operation of Electronic frequency counter for the measurement of frequency and time period.
		    2.3 Power Measurement by bolometer & calorimetric method
			5

B	3	**CRO and its Application:**
		    3.1 Block diagram of CRO
		    3.2 Cathode Ray Tube, Deflection Amplifier, Time base generator, Delay line.
		    3.3 Electrostatic deflection technique. Automatic synchronization of time base.
		    3.4 Basic control of CRO
		    3.5 Different types of probes.
		    3.6 Dual trace, dual beam CRO.
		    3.7 Measurement of time period, phase, delay time, frequency by CRO.
			10

	4	**Signal Generators:** 4.1 AF sine and square wave generator 4.2 Function generator 4.3 Pulse generator. 4.4 Sweep Generator	5

Books:

Title	Author	Publisher
Electronic Measurements	D.A.Bell	PHI
A course in Electrical & Electronics Measurement & Instrumentation	A.K. Sawhney	Dhanpat Rai Pub. Co
Electronic Instrumentation	Kalsi	Mc Graw Hill
Elements of Electronic Instrumentation & Measurement	J. J. Car	Pearson
Modern Electronic Instrumentation & Measurement Techniques	Helfrick & Cooper	PHI
A Course in Electrical & Electronics Measurement & Instrumentation	J.B. Gupta	S. K. Kataria Pub. Co.
Electronic Measurement & Instrumentation	Bell	Oxford
A course in Electrical & Electronics Measurement & Instrumentation		

End Semester Examination Scheme

		Maximum Marks: 35				Time: 2 Hrs			
		Objective Questions				**Subjective Questions**			
Group	**Module**	**To be set**	**To be answered**	**Marks per question**	**Total Marks**	**To be set**	**To be answered**	**Marks per question**	**Total Marks**
A	1	7	Any 10	1	1 x 10 = 10	4	Any 5 taking at least 2 from each group	5	5 x 5 = 25
	2								
B	3	6				4			
	4								

Note: Above syllabus is same as that of Diploma in Electronics & Instrumentation Engineering(4th Semester)

Syllabus for APPLIED ELECTRONICS I

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the subject : **Applied Electronics I**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 100

Teaching Scheme:
   Theory : 3hrs/week
   Tutorial :
   Practical : 2 hrs/week
	Examination Scheme:
	   Internal Scheme : Teachers Assessment: 10
	                                       Class Test : 20
	   End Semester Exam : 70

Credit: 3	
Aim:	
Sl No.	
1	This subject intends to teach operating principle and application of different electronic power devices
2	The subject knowledge is required in control, Instrumentation and communication system
3	Understanding of the subject will provide the student for assembling, trouble shooting & testing of circuits & devices
Objective:	
Sl No.	The Student will able to
1	To know about Power diode, Power MOSFET ect
2	To know the application of SCR, DIAC, TRIAC etc
3	To know operation & application of rectifier, converter
4	To design power supplies
5	To know the function of Relay
Pre-requisite:	
Sl No.	
1	Basic Electronic Engineering
2	Basics on different active and passive components

		Contents	
Group	**Module**	**Name of the topic**	**Hrs / Module**
	1	**Power diode**: 1.1 Switching characteristics of power diodes and its specifications. 1.2 Characteristics of fast recovery diodes. 1.6 Rectifier & Filter circuit: Half wave & Full wave rectifier, performance analysis(determination of ripple factor,form factor) circuit design & analysis with capacitor , inductor &capacitor-inductor filter.	5
	2	**Power Transistor**: 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	6

	3	**Thyristors and other power electronics devices**	7
		3.1 Switching characteristics & Two transistors method of SCR, Ratings of SCR.	
		3.2 Triggering circuits of SCR.	
		3.3 Need for series and parallel methods of SCR. Reasons of unequal voltage and current	
		3.4 distribution and equalization networks.	
		3.5 Layer diagram, Characteristics, operating principle and application of thyristor	
		3.6 family devices - Photo sensitive SCR, GTO, SCS, DIAC & TRIAC	
	4	**Controlled Rectifiers / Converter**	6
		4.1 Single phase Fully Controlled Half Wave Converter with load (R, R-L)	
		4.2 Single Phase Fully Controlled Full Wave Converter with load (R, R-L)	
		4.3 Single phase Fully Controlled Bridge Converter with load (R, R-L)	
		4.4 Single phase Fully Controlled centre tap Converter with load (R, R-L)	
B	5	**Switching & Pulse circuit**	8
		5.1 Transistor, FET as switch, switching principle, its practical applications.	
		5.2 Non linear circuit - Clipper, diode series & shunt, positive & negative biased & unbiased & combinational clipper	
		5.3 Clamper- positive & negative clamper	
		5.4 Voltage doubler circuit.	
		5.5 Pulse wave & Square wave generator, Duty cycle of pulse wave & square wave,.	
		5.6 Multivibrator- basic principle, classification, Circuit, working, frequency, application of astable, mono-stable, bi-stable multivibrator	
	6	**Voltage Regulator, SMPS**	
		6.1 Voltage Regulator: percentage regulation, Series & Shunt voltage regulator, Three terminal IC regulator,	
		6.2 Buck regulator	
		6.3 SMPS : Explanation with diagram.	
	7	**Protective Relaying**	6
		7.1 Operating principles and construction (in brief) of: Electromagnetic relays, thermal relays, static relays (with merits and demerits), and Microprocessor based relays, (conception only)	
		7.2 Over current relay--- Time-current characteristics of definite time, instantaneous, inverse time and IDMT Relays.	

Books:

Title	Author	Publisher
Power Electronics	Gupta, Singhal	S K Khataria
Industrial Electronics & control	B N Pal	PHI
Industrial Electronics	Zaber	TMH
Power Electronics: Circuits, Devices & Applications	Rashid	PHI
Industrial Electronics	Chute & Chute	
Power Electronics	Sachin Sarma	Laxmi Publication
Industrial Electronics	G.K.Mithal	Khanna
Industrial Electronics	Noel Morris	
Modern Power Electronics	P.C.Sen	TMH
Linear Integrated Circuit	Ganesh Babu, Suseela B.	
Industrial Electronics:	F.D.Petruzella	TMH
Engineering Electronics	Ryder	TMH
Thyristors and its Applications	M R Murthy	East West
Badriram & Vishwakarma P.N.	Power System Protection &	TMH, New Delhi

B. Bhalja, R.P.Maheshwari & N.G. Chothani	Protection and Switchgear	Oxford University Press

End Semester Examination Scheme

Maximum Marks: 70	Time: 3 Hrs

Group	Module	Objective 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	10	Any 20	1	1 x 20 =20	3	Any 5 taking at least 2 from each group	10	10 x 5 =50
	2								
	3								
	4								
B	5	15				4			
	6								
	7								

Syllabus for PROCESS INSTRUMENTATION - I LABORATORY

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the subject : **Process Instrumentation -I Laboratory**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 100

Teaching Scheme:
   Theory :
   Tutorial :
   Practical : 3 hrs/week
	Examination Scheme:
	   Continuous Internal Assessment
	     Performance of job : 30
	     Notebook / viva : 20
	   External Assessment
	     On spot Job : 30
	     Viva Voce : 20

Credit: 2	
Skill to be developed:	
Intellectual Skill;	
1	Identification & selection of equipments
2	Selection of transducers
Motor Skill:	
1	Accuracy of measurement
2	Proper connection

List of Practical:

Sl No.	Experiment
1	To plot characteristics of potentiometer and observe the loading effect on output of potentiometer (translation potentiometer and rotational potentiometer)
2	Study of different parts of C type Bourdon Tube pressure gauge
3	Calibration of Bourdon Tube Pressure gauge using dead weight tester.
4	Calibration of Pressure switch using dead weight tester.
5	Measurement of strain/force using strain gauge/Load cell
6	Characteristics and calibration of strain gauge/Load cell
7	Measurement of Linear displacement by LVDT & plotting of characteristics curve
8	Characteristics and calibration of Hall effect sensor
9	Characteristic and calibration of Piezoelectric sensor
10	Speed measurement by contacting Tachometer
11	Speed measurement by Stroboscope
12	Study of Pneumatic Relay, AFR

Syllabus for DIGITAL ELECTRONICS LABORATORY

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the subject : **Digital Electronics Laboratory**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 50

Teaching Scheme:
   Theory   :
   Tutorial :
   Practical: 3 hrs/week
	Examination Scheme:
	   Continuous Internal Assessment
	      Performance of job : 15
	      Notebook /Viva : 10
	   External Assessment
	      On spot Job : 15
	      Viva Voce : 10

Credit: 2

Skill to be developed:

Intellectual Skill;

1	Interpret the result
2	Verify the result

Motor Skill:

1	Accuracy of measurement
2	Proper connection

List of Practical:

Sl No.	Experiment
01	Study of Digital IC data sheet and noting down the characteristics for TTL & CMOS logic families
02	Familiarization of 7400, 7402, 7404, 7408, 7432 & 7486 ICs
03	Verification of truth tables of AND, OR, NOT, NOR, NAND, XOR, XNOR gates.
04	Implementation of various logic gates using NAND & NOR gates (Truth table verification).
05	Verification of DeMorgan's theorem.
06	Implementation of Adder & Subtractor using minimum number of gates.
07	Operation & verification of truth table of S-R & J-K, D, T flip-flop.
08	Design of Ripple counter (4 bit)
09	Design of a universal shift register
10	Design and application of A/D & D/A converter
11	Design of decimal to seven segment display
12	Square wave generation with particular frequency using 555 timer & analysis of output using CRO

Syllabus for APPLIED ELECTRONICS LABORATORY

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the subject : **Industrial Electronics Laboratory**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 50
Teaching Scheme: 　Theory : 　Tutorial : 　Practical: 2 hrs/week	Examination Scheme: 　Continuous Internal Assessment 　　　Performance of job : 15 　　　Notebook / Viva　 : 10 　External Assessment 　　　On spot Job　　 : 15 　　　Viva Voce　　　 : 10

Credit: 1	
Skill to be developed:	

Intellectual Skill

1	To locate fault in circuit
2	Interpret the waveform

Motor Skill

1	Ability to sketch circuits
2	Ability to interpret circuit
3	

List of Practical

Sl No.	**Experiments** (at least 10)
1	Study of Half wave & Full wave rectifier using diode.
2	To plot VI characteristic of an SCR.
3	Observation of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
4	Observation of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle
5	Speed control of motor using SCRs
6	To study series inverter using SCR
7	To study chopper using SCR
8	To plot VI characteristic of DIAC
9	To plot VI characteristic of TRIAC
10	To plot VI characteristic of UJT.
11	Study of UJT relaxation oscillator. And observe I/P and O/P wave forms
12	Design of a power supply with three terminal IC regulator – design part only
13	Study of transistor circuit as a switch to drive a relay with snubber circuit for protection.
14	To perform speed control of DC series motor by static armature voltage control using single phase half/full controlled converter

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Programming in C**	
Subject Code:	Semester: Fourth
Duration: 17 weeks	Maximum Marks: 50

Teaching Scheme:
    Theory   : 1 hrs/week
    Tutorial :
    Practical: 2 hrs/week
	Examination Scheme:
	    Continuous Internal Assessment
	        Performance of job : 15
	        Notebook, Viva : 10
	    External Assessment
	        On spot Job : 15
	        Viva Voce : 10

Credit: 3	

Aim:	
1	To study basics of C programming

Objective:	
Sl No.	The Student will able to
1	Describe the concepts of constants, variables, data types and operators
2	Develop programs using input and output operations
3	Write programs using looping and branching statements
4	Write program based on arrays and string handling functions
5	Write program using user defined functions, structures and union
6	Write program using C pointer

Pre-requisite:	
1	Introduction with windows Operating System

Chapter	Contents	Hrs/ Chapter

01	**Basics of C**
	    1.1 C character set, tokens, constants, variables, keywords
	    1.2 C operators (arithmetic, logical, assignment, relational, increment and decrement, conditional, bit wise, special, operator precedence), C expression date types
	    1.3 Formatted input, formatted output	

02	**Decision Making**
	    2.1 If statement (if, if-else, else - if ladder, nested if-else), Switch case statement, Break statement
	    2.2 while, do, do-while, continue statements	

03	**Arrays and Strings**
	    3.1 Declaration and initialization of one dimensional, two dimensional and character array, accessing array elements
	    3.2 Declaration and Initialization of string variables, string handling function from standard library (strlen (), strcpy(), strcat(), strcmp())	

04	**Functions, Structures**
	    4.1 Need of functions, scope and lifetime of variables, defining functions, function call (call by value, call by reference), return value, storage classes, category of function (no argument no return value, no argument with return value, argument with return value), recursion.
	    4.2 Definition of structure, declaring and accessing structure members, initialization of structure, arrays of structure.	

05	**Pointers** 5.1 Understanding pointers, 5.2 Declaring and accessing pointers 5.3 Pointer arithmetic	

Practical:	
Skill to be developed:	
Intellectual Skill:	
1	Use of programming language
2	Apply different logics to solve given problem
3	Write program using implementations for the same problem
4	Identify different types of errors as syntax semantic, fatal, linker & logical
5	Debugging of programs
6	Understanding different steps to develop program.
Motor skill:	
	Proper handling of computer system

List of practical

Sl No.	Experiments
	Write C programming
01	Any one from 1 to 3 1) To display hexadecimal, decimal, octal formats of the entered numbers. 2) To display entered number with leading zeros and trailing zeros 3) To display entered number with right justification and left justification 4) To demonstrate all possible formatting specifiers
02	Any one from 5 to 6 5) To find greatest / smallest of 3 numbers 6) To display pass class, second class, distinction according to the marks entered
03	Any one from 7 & 8 7) To find even or odd numbers 8) To display spellings of numbers 1-10 on entry
04	Any one from 9 & 10 9) To display menu 1. Addition 2. Subtraction 3. Multiplication 4. Division and execute it using switch case 10) To check whether there exist real roots of a quadratic equation and if exist find them
05	Any three from 11 & 16 11) To display our college name twenty times on screen 12) To demonstrate Continue and Break statements within loop structure 13) To display all natural, even, odd numbers from 1 to 100 using different loop structure 14) To perform addition of 1 to 100 numbers 15) To find GCD, LCM of two integral number 16) To generate all prime numbers within the given range
06	Any one from 17 & 18 17) To find smallest/ largest numbers from array elements 18) To sort array elements in ascending / descending order
07	Any one from 19 & 21 19) To enter elements of 3X3 matrix and display them 20) to calculate addition / subtraction of 2 dimensional matrix 21) To calculate multiplication of two dimensional matrix

08	Any two from 22 & 26	
	22) To calculate area of circle using function	
	23) To calculate factorial of any given number using recursion	
	24) To demonstrate call by reference, call by value	
	25) To maintain and manipulate student data using structure	
	26) To perform four arithmetic functions on pointers	

Books:

Title	Author	Publisher
Programming in C	E. Balagurusamy	Mc Graw Hill
Let Us C	Kanetkar	BPB
Programming in C	Reema Thereja	Oxford University Press
Complete Reference C	Herbert Shield	Mc Graw Hill
A Textbook on C	E. Karthikeyan	PHI
Introduction to programming using C	Pawar	Wiley
Programming With C	T. Jeyapoovan	Vikas
All of C	Ghosh	PHI
Project Using C	P V N Varalakshmi	Scitech
Programming in C	S. S. Khandare	S. Chand &. Co
Programming in C	J. Shah	Charotar

Websites:

http://cplus.about.com/od/beginnerctutoriali/a/blctut.htm
http://computer.howstuffworks.com/c.htm
http://www.indiastudycenter.com/studyguides/sc/objtest/default.asp

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Development of Life Skill II**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 50

Teaching Scheme:
   Theory :
   Tutorial :
   Practical: 2 hrs/week
	Examination Scheme:
	   Internal Assessment : 25
	
	   External Assessment : 25

Credit: 1	
Aim:	
Sl No.	
1	In today's competitive world, the nature of organization is changing with very rapid speed. In this situation the responsibility of diploma holder is not unique. He will be a part of a team and will have to work as a team with others in the organization. As such the individual skills are not sufficient there to work at his best
2	This subject will develop a student's mind to be a part of the team It will develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team
3	Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems.
Objective:	
Sl No.	The Student will able to
1	Develop the status of mind to work as a team
2	Apply problem solving skills for a given situation.
3	Use effective presentation techniques.
4	Apply techniques for effective time management.
5	Apply task management techniques for given project.
6	Enhance leadership traits.
7	Resolve conflict by appropriate method
8	Face interview without fear.
9	Follow moral and ethics.
10	Convince people to avoid frustration
Pre-requisite:	
Sl No.	
1	Team work and presentation skill
2	Positive attitude and thirst of learning

Contents		
Module	**Name of the topic**	**Hrs / module**
1	**Social Skill** Societies, Social Structure, Develop Sympathy and Empathy	
2	**SWOT Analysis** Concept, How to make use of SWOT	

3	**Interpersonal Relation**
	   3.1 Source of conflict, Resolution of conflict,
	   3.2 Ways to enhance interpersonal relation	

4	**Problem Solving**
	  4.1 Steps in Problem Solving
	    4.1.1 Identify and clarify the problem
	    4.1.2 Information gathering related to problem
	    4.1.3 Evaluate the evidence
	    4.1.4 Consider alternative solutions and their implications
	    4.1.5 Choose and implement the best alternatives
	    4.1.6 Review
	  4.2 Problem solving techniques
	    4.2.1 Trial and error
	    4.2.2 Brain Storming
	    4.2.3 Lateral Thinking	

5	**Presentation Skills**
	  5.1 Body language
	  5.2 Dress
	  5.3 Posture, Gesture, Eye contact and facial expression
	  5.4 Voice and language- Volume, Pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language, Practice of speech
	  5.5 Use of Aids- OHP, LCD projector, white board	

6	**Group Discussion & Interview Techniques**
	  6.1 Group Discussion
	    6.1.1 Introduction to group discussion
	    6.1.2 Ways to carry out group discussion
	    6.1.3 Parameters- Contact, body language, analytical and logical thinking, decision making
	
	  6.2 Interview Techniques
	    6.2.1 Appearance at interview board
	    6.2.2 Tips for handling common questions	

7	**Working in Teams**
	  7.1 Understanding the utility to work as a team
	  7.2 Tips to work effectively in team
	  7.3 Establish good rapport
	  7.4 Interest toward others and work effectively with them to meet common objectives
	  7.5 Tips to provide and accept feedback in a constructive and considerate way
	  7.6 Leadership in team
	  7.7 Handling frustration in team	

8	**Task management**
	  8.1 Introduction
	  8.2 Task identification
	  8.3 Task planning, Organizing and Execution
	  8.4 Closing the task	

Student may perform the following task as practical / hands on practice

1 SWOT Analysis- - Analysis yourself with respect to your strength and weakness, opportunities and threats. Following points may be useful for doing SWOT-
  1.1 Past experience
  1.2 Achievements
  1.3 Failures
  1.4 Feedback from others

2 Undergo a test on reading skill/ memory skill administered by the teacher
3 Solve the puzzles
4 Group wise social activity like Tree Plantation, Blood donation, environment protection, distribution of cloths to poor, awareness camp like cleanliness in slump area etc.
5 Deliver seminar on given topic.
6 Watch/ listen an informative session on social activities. Make report on topic of your interest using audio / visual aids. Make a report on the programme
7 Conduct an interview of a personality and write a report on it
8 Discuss a topic in a group and prepare minutes of discussion . Write through description of the topic discussed.
9 Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by teacher

Note: please note that these are the suggested assignments on the given contents/ topics. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

Books:

Title	Author	Publisher
Adams Time Management	Marshal Cooks	Viva Books
Basic Management Skills for All	E.H. Mc Grath, S.J.	PHI
Body Language	Allen Pease	Sudha Publications Pvt Ltd
Creativity and Problem Solving	Lowe and Phil	Kogan Page (I) Pvt Ltd
Decision making & Problem Solvong	Adair, J	Orient Longman
Develop your Assertiveness	Bishop, Sue	Kogan Page (I) Pvt Ltd
Make Every Minute Count	Marion E Haynes	Kogan Page (I) Pvt Ltd
Organizational Behaviour	Steven L mcShane and Mary Ann Glinow	Tata McGraw Hill
Organizational Behaviour	Stephen P. Robbins	PHI
Presentation Skill	Micheal Hatton	ISTE N Delhi
Stress Management Through Yoga and meditation		Sterling Publisher Pvt Ltd
Target Setting and goal Achievement	Richard Hale, Peter Whilom	Kogan Page (I) Pvt Ltd
Time Management	Chakravarty, Ajanta	Rupa & Company
Working in Team	Harding ham, A	Orient Longman

INTERNET ASSISTANCE

INTERNET ASSISTANCE
1. http://www.mindtools.com
2. http://www.stress.org
3. http://www.ethics.com
4. http://www.coopcomm.org/workbook.htm
5. http://www.mapfornonprofits.org/
6. http://www.learningmeditition.com http://bbc.co.uk/learning/courses/
7. http://eqi.org/
8. http://www.abacon.com/commstudies/interpersonal/indisclosure.html
9. http://www.mapnp.org/library/ethics/ethxgde.htm
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. http://members.aol.com/nonverbal2/diction1.htm
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. http://snow.utoronto.ca/Learn2/modules.html
14. http://www.quickmba.com/strategy

Note: Syllabus of Development of Life Skill II will be revised to make it common for all dept. & It will be circulated separately.

Syllabus for PROFESSIONAL PRACTICE II

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Professional Practice II**	
Subject Code:	Semester: Fourth
Duration: 6 months	Maximum Marks: 50

Teaching Scheme:
   Theory :
   Tutorial :
   Practical: 2 hrs/week
	Examination Scheme:
	(Only Internal Assessment)
	   Continuous Internal Assessment : 30
	    Viva / report / notebook etc : 20

Credit: 1	
Aim:	
1	After passing most of the diploma holders join industries. Due to globalization and competition in the industrial and service sector the selection for job is based on campus interview and competitive tests
2	While selecting candidates a normal practice adopted is to see general confidence, attitude, ability to communicate, in addition with basic technical concept.
3	Professional practice will provide opportunity to students to undergo activities which will enable them to develop confidence, attitude etc. Industrial visits, expert lecturers, seminars on technical topics and group discussions are planned here so that there will be increased participation of students in learning process.
Objective:	
Sl No.	The Student will able to
1	Answer aptitude and reasoning test successfully
2	Acquire information from different sources
3	Prepare notes for given topics
4	Present given topic in a seminar
5	Interact with peers to share thought
	Prepare a report on industrial visit, expert lecture

Pre-requisite:		
1	Knowledge on basic electrical & electronic engineering	
2	Knowledge on Instrumentation engineering	
3	Knowledge of computer	
4	Knowledge of internet access	
Contents		
Module	**Name of the Topic / activity**	**Hrs / Module**

1	**Aptitude and Reasoning Practice**
	    1.1 General Aptitude
	        1.1.1 Arithmetic Aptitude
	        1.1.2 Data Interpretation
	
	    1.2 Verbal & Reasoning
	        1.2.1 Verbal Ability
	        1.2.2 Logical Reasoning
	        1.2.3 Verbal Reasoning
	        1.2.4 Non Verbal Reasoning	

2	**Lecture by Professional / Industrial experts / Student Seminar based on following areas (at least two)** a) Fire Fighting / safety Precaution and First Aids b) Yoga Meditation c) Problems of drinking water in rural areas d) Interview techniques e) Various petroleum product and its application f) Advancement of modern and new energy source g) Green Energy Concept h) Temperature reading and controlling through fiber Cable i) Electrical and pneumatic transmission j) Smart and Intelligent Instruments k) Any other suitable topic	
3	**Group Discussion** The student should discuss in a group of six to eight students. Two topics (at least) for group discussions may be selected by the faculty members. Some of the suggested topics are- a) Road safety rules awareness b) CNG vs LPG as fuel c) Load shading and remedial measure d) Safety in day to day life e) Energy saving in institute f) Tuitions should be banned g) Computers have resulted in unemployment h) Effects of cinema/media on youth i) Criticism is good or bad j) Advantage of co- education k) Any other suitable topic	
4	**Field Visit**	

	Structured field visit (at least 1) be arranged and report of the same should be submitted by the student, as part of term work. The field visit may be arranged in the following areas / Industries a) Dairy plant b) Soft drink plant c) Instrument calibration laboratory d) Captive power Plant (Thermal) e) Power Generation Station f) Jute Industry g) Water treatment plant h) Paper printing plant i) Any other plant / laboratory	

5	**Free & Open Source Software**
	5.1 Introduction to LibraOffice Calc
	5.1.1 Getting started with LibraOffice Calc
	   5.1.1.1 Working with Cells
	   5.1.1.2 Working with Sheets
	   5.1.1.3 Formatting data
	   5.1.1.4 Basic data manipulation
	   5.1.1.5 Working with data
	5.1.2 Different operations in LibraOffice Calc
	   5.1.2.1 Using Charts & graphs
	   5.1.2.2 Images and graphics
	   5.1.2.3 Advanced formatting and protection
	   5.1.2.4 Formulas and functions
	   5.1.2.5
	5.2 Introduction to LibraOffice Impress
	5.2.1 Getting Started with LibraOffice Impress
	   5.2.1.1 Creating a presentation document
	   5.2.1.2 Viewing a presentation document
	   5.2.1.3 Inserting Picture and objects
	   5.2.1.4 Printing a presentation document
	5.2.2 Presentation in Impress
	   5.2.2.1 Slide Master Slide Design
	   5.2.2.2 Custom Animation
	   5.2.2.3 Slide Creation
	   5.2.2.4 Presentation Notes	

Books:

Title	Author	Publisher
Quantitative Aptitude	Mohon Rao	Scitech
Quantitative Aptitude and Reasoning	Praveen	PHI
A modern Approach to Verbal and Nonverbal Reasoning	R S Aggrawal	S Chand
Quantitative Aptitude for Competitive Exam	R S Aggrawal	S Chand
A New Approach to Reasoning Verbal & Non-verbal	B.S. Sijwali,Indu Sijwali	Arihant
First Track Objective Arithematic	Rajesh Verma	Arihant
Reasoning (verbal/ Non-Verbal/ Logical)	J K Sharma	Unique Publisher
How to Crack Test of Reasoning	Jaikishan, Premkishan	Arihant
General Aptitude: Quantitative Aptitude & Reasoning for Competitive Examinations	GKP	G K Publisher

Further suggestion may be submitted to the syllabus committee members by email. List

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