

**CURRICULAR STRUCTURE FOR PART- III (3RD 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: FIFTH												
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 - II	3	3	1	-	10	20	30	70	-	-	100
2.	Advanced Process Control	3	3	1	-	10	20	30	70	-	-	100
3.	Applied Electronics II	2	2	-	-	5	10	15	35	-	-	50
4.	Microprocessor	3	3	-	-	10	20	30	70	-	-	100
5.	Analytical Instrumentation	2	2	-	-	5	10	15	35	-	-	50
6.	Optical Instrumentation	2	2	-	-	5	10	15	35	-	-	50
7.	Process Instrumentation - II Laboratory	2	-	-	3	-	-	-	-	100	-	100
8.	Process Control Laboratory	2	-	-	3	-	-	-	-	100	-	100
9.	Microprocessor Laboratory	2	-	-	3	-	-	-	-	50	-	50
10.	Industrial Project & Entrepreneurship Development	1	-	-	2	-	-	-	-	50	-	50
11.	Professional Practice - III	1	1	-	2	-	-	-	-	-	50	50
Total		23	16	2	13	45	90	135	315	300	50	800

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

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

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

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

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

Total Marks : 800

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

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

Syllabus for PROCESS INSTRUMENTATION – II

Name of the Course : Diploma in Instrumentation and Control Engineering			
Name of the Subject : Process Instrumentation II			
Subject Code:		Semester: Fifth	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme: Theory : 3hrs/week Tutorial : 1hrs/week Practical :		Examination Scheme: Internal Scheme : Teachers Assessment: 10 Class Test : 20 End Semester Exam : 70	
Credit: 3			
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, velocity, acceleration , torque, density viscosity		
Objective:			
Sl No.	The Student will able to		
1	Know the principle of operation, advantages, disadvantages of different process parameter like Temperature, Level, Flow etc		
2	Choose the proper measuring instrument for specific measurement		
3	Compare the different instruments used for a specific operation		
4	Know the specification of different measuring instruments		
5	Know the instrumentation system for hazardous location		
6	Know the protocols for industrial data communication		
Pre-requisite:			
Sl No.			
1	Fundamental idea of Instrumentation system		
2	Basics of electronics		
3	Basics of physics		
Contents			
Group	Module	Name of the topics	Hrs / Module
A	1	Temperature Measurement 1.1 Temperature scale-ITS 90, Different types of Thermometers- liquid in glass, liquid in metal, bimetallic thermometer 1.2 Thermocouple -- construction, composition of thermocouple materials, cold junction compensation, range and types of different thermocouples, thermowell, 1.3 RTD -- construction & composition of RTD, Pt100, Two wire, three wire & four wire RTD, Self heating error. 1.4 Thermistor --construction & composition of thermistor, types of thermistor. 1.5 Non contact type temperature measurement-- Radiation & Optical Pyrometer. 1.6 Semiconductor type temperature sensor	12
	2	Level measurement: 2.1 Gauge glass, float & displacer type. 2.2 Differential Pressure type.	10

		2.3 Capacitive & Conductivity type. 2.4 Radar, ultrasonic & nuclear type.	
	3	Flow measurement: 3.1 Bernoulli's theorem, turbulent & laminar flow, Reynolds number. 3.2 Orifice, Venturi, Flow Nozzle, & Rotameter. 3.3 Electromagnetic, Turbine, Ultrasonic & Vortex Flow Meter. 3.4 Coriolis mass flow meter, Thermal mass flow meter, Positive displacement flow meter, Open channel flow meter.	15
B	4	Instrumentation in Hazardous location: 4.1 Definition of Hazardous area & Safe area, Area classification, Material classification 4.2 Explosion proof enclosure, Pressurization, Intrinsic safety. 4.3 Brief idea on PHA (Process Hazards Analysis),SIS,SIF,SIL,PDF,SFF	8
	5	Industrial Communication and Field Buses 5.1 Industry standard 4 – 20 mA analog communication 5.2 Introduction to smart sensor 5.3 Fieldbuses: What is a Fieldbus, Topologies, Terminators, Benefits 5.4 Highway Addressable Remote Transducer (HART): Evolution and Adaptation of HART Protocol, HART Encoding and Waveform, HART Character, Addressing, Communication Modes, HART Networks 5.5 Foundation Fieldbus: Features, Architecture, H1 Benefits, HSE Benefits, Interoperability of Subsystems, Function Blocks, The Communication Process, OSI Reference Model, Technology of Foundation Fieldbus, Link Active Scheduler, Device Description 5.6 Profibus: The Profibus Family, Transmission Technology, Communication Protocols, Device Classes, Profibus SP and PA, Foundation Fieldbus and Profibus – A Comparison 5.7 Wireless Fieldbuses: WHART and ISA100.11a	15

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Books:		
Title	Author	Publisher
Instrumentation & Control System	K P Raju & Y J Reddy	Mc Graw Hill
Introduction to Measurement & Instrumentation	Ghosh	PHI
Principles of Industrial Instrumentation	D.Patranabis	TMH
Measurement System Application & Design	E.O.Doeblin	Mc Graw Hill
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
Mechanical & Industrial Measurement	R. K. Jain	Khanna Publisher
Instrument Technology, Vol I	E. B. Jones	Butterworth
Computer Aided Process Control	S K Singh	PHI

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								

Syllabus for ADVANCED PROCESS CONTROL

Name of the Course : Diploma in Instrumentation and Control Engineering			
Name of the Subject : Advanced Process Control			
Subject Code:	Semester: Fifth		
Duration: 6 months	Maximum Marks: 100		
Teaching Scheme: Theory : 3 hrs/week Tutorial : 1 hrs/week Practical:	Examination Scheme: Internal Scheme : Teachers Assessment: 10 Class Test : 20 End Semester Exam : 70		
Credit: 3			
Aim:			
Sl No.			
1	Monitoring and control of process is the most important part of industry. The subject deals with advanced control system strategies used for process control.		
2	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	Learn to draw P&I diagram..		
2	Design different control techniques like Cascade, Ratio, Feed forward, Adaptive, Split range etc		
3	Learn different control schemes for different specific plant operation		
4	Learn function of SCADA, PLC, DCS etc		
Pre-requisite:			
Sl No.			
1	Knowledge of basic control principles		
Contents			
Group	Module	Name of the topic	Hrs / Module
A	1	Process Drawing 1.1 Idea on Block Flow, Process Flow Diagram (PFD), Piping & Instrumentation Diagram (P&ID), Equipment Mechanical Drawing, Three Dimensional	12

		Layout 1.2 P&I diagram of different control scheme	
	2	Advanced Control Techniques: 2.1 Cascade control. 2.2 Ratio control. 2.3 Feed forward control. 2.4 Adaptive control 2.5 Split range control	14
	3	Process Plant Control Schemes: 3.1 3-element boiler drum level control in Thermal Power Plant. 3.2 Combustion control of Furnace in Thermal power plant. 3.3 Any basic control scheme in steel plant. 3.4 Paper-pulp preparation & control in paper plant. 3.5 Control scheme of distillation column—overhead and bottom product. 3.6 Reactor temperature control in Nuclear power plant. (In all cases the basic scheme, necessary PI diagram & their illustration are required only.)	11
	4	Evaluation of Computer in Control Techniques: 4.1 Control system before computer entered into control system. 4.2 Chronological evaluation of computer in control system starting from DDC to artificial intelligence or more. 4.3 Block diagram, advantage, disadvantage, operation of DDC (Direct Digital Control)	11
B	5	Multiloop Control System: 5.1 SCADA: simple block architecture, operation. 5.2 Definition of PLC, Relevance of sequential control 5.3 Block architecture of PLC, Operation of PLC, Language used in PLC 5.4 Knowledge of programming in Ladder, FBD, STL 5.5 DCS- Definition, Block architecture, Functioning, Comparison with PLC, Redundancy	12

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	TMH
Modern Control Engineering:	K.Ogata	PHI
Principles of Industrial Process Control	D.P.Eckman	J. Wiley & Sons
Industrial Automation	Pessen	Wiley India
Automatic Process Control	D.P.Eckman	J. Wiley & Sons
Nice's Control System Engineering	Gupta	Wiley India
Basic Instrumentation & PLC	U Rathore	S K Khataria
Process Control Instrumentation Technology	Curtis Johnson	PHI
Automatic Control System	Kuo	Wiley India
Programmable Logic Controller	Frank D Petruzella	Mc Graw Hill

Modern Control System	Ogata	PHI							
Control System Theory	S Dasgupta	Khanna							
Control Systems	K Alice Mary & P Ramana	University Press							
Control System	Anand Kumar	PHI							
Control Systems	K Alice Mary & P Ramana	University Press							
PLC & SCADA (Theory & Practice)	Prof. Rajesh Mehra & Er Vikrant Vij	University Science Press (An imprint of Laxmi Publications Pvt. Ltd)							
A Course in Modern Control System	Sourav Mani Tripathi	University Science Press (An imprint of Laxmi Publications Pvt. 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	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 APPLIED ELECTRONICS II

Name of the Course : Diploma in Instrumentation and Control Engineering	
Name of the subject : Applied Electronics II	
Subject Code:	Semester: Fifth
Duration: 6 months	Maximum Marks: 50
Teaching Scheme: Theory : 2hrs/week Tutorial : Practical :	Examination Scheme: Internal Scheme : Teachers Assessment: 05 Class Test : 10 End Semester Exam : 35
Credit: 2	
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
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
A	1	CHOPPERS: 1.1 Principle of operation of chopper and its application. 1.2 Types of choppers (Class A, Class B, Class C, and Class D) . 1.3 Principle of operation of 4-quadrant chopper. 1.4 Principle of operation of Cycloconverter and its applications.	6
	2	SPEED CONTROL OF DC MOTOR: 2.1 TYPES OF SPEED CONTROL OF DC MOTOR: Armature Volt – Field Current Control. 2.2 DRIVE SYSTEM: Controlled Rectifier Drive – Reversible Drive – Quadrant Drive – 2.3 Dual Converter	6
	3	SPEED CONTROL OF AC MOTOR: 3.1 Types of speed variation – Frequency variation – Stator volt variation – Closed loop control – Types of feedback. 3.2 TYPES OF BREAKING: Regenerative breaking – Plugging.	5
B	4	INVERTERS: 4.1 Principle of operation of self-oscillating and driving inverter 4.2 Principle of operation of series, parallel, half bridge and full bridge inverter 4.3 Applications of inverter.	6
	5	UPS: 5.1 Principle of operation of Online, Offline & line Interactive UPS, 5.2 Use of storage devices and working principle of battery charger	5
	6	STEPPER MOTOR: 6.1 Types and principle of operation of stepper motor. 6.2 STEPPER MOTOR CONTROL: Stepper Drive – Dual Voltage Drive – Chopper Drive.	4
Books:			
Title		Author	Publisher
Power Electronics		Gupta, Singhal	S K Khataria
Industrial Electronics & control		B N Pal	PHI
Power Electronics		Khanchandani	TMH
Industrial Electronics		Zaber	TMH
Power Electronics: Circuits, Devices & Applications		Rashid	PHI
Industrial Electronics		Chute & Chute	
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

Fundamentals of Power Electronics & Drives		A Chakrabarty		Dhanpat Rai & Co					
Analysis of Thyristor Power Conditioned Motors		S.K Pillai		University Press					
Power Electronics		Sachin S Sharma		University Science Press (An imprint of Laxmi Publications Pvt. Ltd)					
Industrial Electronics & Control Drives		Shweta Goyal & Swati Gargust		S K Khataria & Sons					
Power Electronics		A K Gupta, LP Singh, Akhilesh R Upadhyay		Dhanpat Rai Publishing Company					
End Semester Examination Scheme									
Maximum Marks: 35				Time: 2 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	7	Any 10	1	1 x 10 =10	4	Any 5 taking at least 2 from each group	5	5 x 5 = 25
	2								
	3								
B	4	7	Any 10	1	1 x 10 =10	4	Any 5 taking at least 2 from each group	5	5 x 5 = 25
	5								
	6								

Syllabus for MICROPROCESSOR

Name of the Course : Diploma in Instrumentation and Control Engineering	
Name of the subject : Microprocessor	
Subject Code:	Semester: Fifth
Duration: 6 months	Maximum Marks: 100
Teaching Scheme: Theory : 3hrs/week Tutorial : Practical :	Examination Scheme: Internal Scheme : Teachers Assessment: 10 Class Test : 20 End Semester Exam : 70
Credit: 3	
Aim:	
Sl No.	
1	Today microprocessors and microcontrollers have become an integral part of all automatic and semi automatic machines. Therefore there is a growing need of engineers / technicians in this field. Hence, it is necessary to study microcontroller basics, hardware and its programming.
2	This subject covers microprocessor 8085 architecture, its instruction set, programming and applications. After completing this subject the student can write and execute programs for microprocessor based applications.
Objective:	
Sl No.	Students will able
1	Describe architecture and operation of microprocessor 8085
2	Develop assembly language programs using instruction set of 8085
3	Design and develop microcontroller based systems
4	Explain various applications of microcontrollers
Pre-requisite:	
1	knowledge of digital electronics

Contents			
Group	Module	Name of the topic	Hrs / Module
A	1	Introduction to Microprocessor 1.1 Microprocessor definition 1.2 Operation of ALU 1.3 Van Numan, Haward architecture 1.4 Evaluation of Microprocessor 1.5 Block diagram of Microprocessor based system 1.6 Machine Language, Assembly language, High level Language, Assembler, Compiler	5
	2	Microprocessor Architecture & memory Interfacing 2.1 8085 architecture and its functional block 2.2 Pin details of Intel 8085 chip 2.3 De-multiplexing address and data bus, generation of control signals 2.4 Machine cycles and timing diagram of instructions 2.5 Types of memory, Memory interfacing.	8
B	3	Programming of 8085 Microprocessor 3.1 Instruction set of 8085 3.2 Addressing modes 3.3 Writing assembly language program- looping, counting, indexing, BCD arithmetic, stack and subroutine, Delay, conditional call & return instruction	10
	4	Interfacing 4.1 Basic interfacing concept, interfacing input and output devices, memory mapped I/O and I/O mapped I/O 4.2 8155 interfacing and programming 4.3 8255 Interfacing and programming 4.4 Keyboard and display interfacing and programming 4.5 ADC (0801/0808) and DAC(0808/0809) interfacing and programming 4.6 Interfacing with Stepper Motor	13
	5	Interrupt, DMA and Serial Communication 5.1 Interrupt structure of 8085, RST instruction, vectored interrupts, interrupt process 5.2 8259 interrupt controller 5.3 Data transfer techniques 5.4 8257 DMA controller 5.5 Serial I/O lines of 8085 and implementation of serial data communication using SID, SOD lines	9

Books:

Title	Author	Publisher
Microprocessor architecture, programming & applications	R.S.Gaonkar	Wiely
Microprocessor& Microcontroller	N Senthil	Oxford University press
Microprocessor and Microcontroller	Kumar, Saravanan, Jeevananthan	Oxford University Press
Introduction to Microprocessor	A.P. Mathur	TMH
Digital Circuits & Microprocessors	Herbert taub	TMH Pub.
Microprocessor Interfacing & Microcontroller	Azeez, Shemeena	Scitech
Computer system Architecture	Morris Mano	PHI India
Computer organization & Design	P.Pal Choudhuri	PHI
The 8085 Microprocessor: Architecture, Programming & Interfacing	Udaykumar	Pearson
The 8085 Basic, Programming & Interfacing	Kulkarni, Sontakke	SadhuSudha Prakasan
Microprocessor and Interfacing	D. Hall	TMH

Microprocessor & Peripherals		Chowdhury				Scitech									
Microprocessor 8085 & its Interfacing		Sunil Mathur				PHI									
Microprocessor Comprehensive Study:Architecture Programmiing & Interfacing		Naresh Grover													
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														
B	4	15				Any 20				1	1 x 20 =20	4	Any 5 taking at least 2 from each group	10	10 x 5 =50
	5														
	6														

Syllabus for ANALYTICAL INSTRUMENTATION

Name of the Course : Diploma in Instrumentation and Control Engineering			
Name of the Subject : Analytical Instrumentation			
Course Code:	Semester: Fifth		
Duration: 6 months	Maximum Marks: 50		
Teaching Scheme: Theory : 2 hrs/week Tutorial : Practical:	Examination Scheme: Internal Scheme : Teachers Assessment: 05 Class Test : 10 End Semester Exam : 35		
Credit: 2			
Aim:			
Sl No.			
1	Analysis of different parameter in Industry is most important to maintain best quality of product. This subject will develop students about different analyzers		
Objective:			
Sl No.	The Student will able to		
1	Know operation & application of Gas analysers		
2	Know operation & application of liquid analyser		
3	Know operation & application of solid analysers		
4	Know different sampling system		
Pre-requisite:			
Sl No.			
1	Idea on basic analog and digital electronics		
2	Idea on basic chemistry		
Contents			
Group	Module	Name of the topic	Hrs/Module

A	1	Gas Analyzer: <ul style="list-style-type: none"> • Spectroscopic techniques- IR absorption spectroscopy, single channel & dual channel IR spectrometer, different components of IR spectrometer- source, detector, monochromator. • Thermal conductivity type. • Paramagnetic oxygen analyzer- Magneto dynamic type, Magnetic wind type. • Zirconia cell for oxygen analysis. • Humidity & moisture measurement. 	7
	2	Liquid Analyzer: <ul style="list-style-type: none"> • UV & Visible spectroscopy techniques, sources, detectors, monochromators. • Colorimeter, Lambert-Beer's law, its applications & limitations. • Emission & Fluorescence spectroscopy. • Measurement of pH. • Measurement of conductivity & Salinity. • Measurement of dissolved oxygen. 	8
B	3	Solid Analyzer: <ul style="list-style-type: none"> • X-ray analysis: concept only 	3
	4	Special Types of Analyzers: <ul style="list-style-type: none"> • Gas chromatography, Liquid chromatography. • Mass spectrometer • Basic idea of NMR – only schematic diagram and working principles, applications 	7
	5	Sampling Systems: <ul style="list-style-type: none"> • Gas sampling. • Steam & Water analysis system. 	5

Books:

Title	Author	Publisher
Handbook of Analytical Instruments	R S Khandpur	TMH
Instrumental Methods of Analysis	Willard, Merrit, Dean & Settle	CBS Pub.Co.
Analysis Instrumentation	R.P.Khare	CBS
Analytical Instrumentation	Skoog & Larry	Saunders Pub. Co.
Instrumentation Handbook	B. Liptak	Butterworth-Heinmann .
Principle of Industrial Instrumentation	D Patranabis	TMH

End Semester Examination Scheme

Maximum Marks: 35						Time: 2 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	6	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	7	Any 10	1	1 x 10 = 10	4	Any 5 taking at least 2 from each group	5	5 x 5 = 25
	4								
	5								

Syllabus for OPTICAL INSTRUMENTATION

Name of the Course : Diploma in Instrumentation and Control Engineering				
Name of the Subject : Optical Instrumentation				
Subject Code:			Semester: Fifth	
Duration: 6 months			Maximum Marks: 50	
Teaching Scheme: Theory : 2 hrs/week Tutorial : Practical:			Examination Scheme: Internal Scheme : Teachers Assessment: 05 Class Test : 10 End Semester Exam : 35	
Credit: 2				
Aim:				
Sl No.				
1	Optical fiber communication is better than copper wire communication. Now a days in every sector, signal transmission is done via optic fiber. In process plant also there is numerous application of optical sensor, detector to measure and control process parameter. So a diploma holder having instrumentation background must have sufficient knowledge on this subject.			
Objective:				
Sl No.	The Student will able to			
1	Explain the configuration, advantage of a fiber optic communication system			
2	Understand material required for the production of optical fiber			
3	Understand jointing, splicing and connectors of optical fiber			
4	Understand the features of LED, LASER, Optocoupler			
5	Understand about photodetectors			
6	Understand the need of optical amplifier			
7	Understand Industrial application of fiber optic sensor			
Pre-requisite:				
Sl No.				
1	Basic Electronics			
2	Theory of light			
Contents				
Group	Module	Name of the topic	Hrs/Module	Marks
A	01	Introduction 1.1 Block diagram of an optical fiber communication systems, 1.2 advantages & disadvantage of optical fibre communication 1.3 Different components used in optical fiber communication system 1.4 application of fibre optic communication	4	
	02	Optical Fiber & Ray Propagation 2.1 Components in a fiber optic cable 2.2 Types of optical fibers (single & multimode, step index & graded index: basic idea) 2.3 Fiber material 2.4 Ray (meridional) propagation in step index fiber, acceptance angle and numerical aperture 2.5 coupling components for optical fiber (coupler, connector & splices)	6	
	03	Optoelectronic Sources & Amplifier 3.1 Material, construction, Drive Circuitry of Light emitting diodes (LEDs), 3.2 Laser principles, Laser diodes, Operating characteristics of laser diodes, 3.3 LED & Laser materials 3.4 Industrial application of LASER as measurement of distance, length, velocity 3.5 Necessities of Repeater & optoelectronic amplifiers	7	

B	04	Optoelectronic Detectors 4.1 Detector material 4.2 Principles of photo detection, photomultiplier, 4.3 Structure, Characteristics, application of p-n photodiode, p-i-n photodiode and avalanche photodiode, phototransistor, LDR, solar cell 4.4 Optocoupler: main features, basic components, characteristics, speed response	7	
	05	Optical Fiber Sensor 5.1 Block diagram of a generalized fiber optic sensor configuration 5.2 Classification of Fiber Optic sensors 5.3 Explanation of major multimode Fiber Optic Sensors like displacement, pressure, stress, strain, temperature, liquid level sensors. 5.4 Advantages of Optical Sensors	6	

Books:

Title	Author	Publisher
Fiber Optic Communication	Mishra, Ugale	Wiley India Pvt Ltd
Optical Instrumentation	Satyajit Das	S. K Khataria
Optical Fibre Communication	Joseph, C. Palais,	Pearson Education
Optical Fibre Communication	Gerd Keiser	Mc Graw Hill, International
Fiber Optics & Optoelectronics	R.P. Kher	Oxford University Press
Fibre – Optic Communication Systems	G.P. Agrawal	John Wiley and Sons
Optical Fibre Communication and its Applications	S.C.Gupta	Prentice Hall of India
Optical Fibres Communication	John M. Senior	Pearson Education
Optical Communication Systems	J.Gower	Prentice Hall of India
Optical & Optoelectronics Instrumentation	A K Ganguly	Narosa Publishing House
Advance Optical Fiber Communication	K. Roy	Scitech Publication

End Semester Examination Scheme									
Maximum Marks: 35						Time: 2 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	7	Any 10	1	1 x 10 = 10	4	Any 5 taking at least 2 from each group	5	5 x 5 = 25
	2					4			
B	3	7	Any 10	1	1 x 10 = 10	4	Any 5 taking at least 2 from each group	5	5 x 5 = 25
	4								
	5								

Syllabus for PROCESS INSTRUMENTATION - II LAB

Name of the Course : Diploma in Instrumentation and Control Engineering	
Name of the subject : Process Instrumentation -II Lab	
Subject Code:	Semester: Fifth
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	Measurement of temperature using Thermocouple, RTD, Thermistor, AD950
2	Characteristics of LVDT
3	Level measurement by conductivity gage
4	Level measurement by capacitive gage.
5	Flow measurement using Orifice, Rotameter, & D/P transmitter
6	Measurement of Linear displacement by LVDT & plotting of characteristics curve
7	Study the different parts of control valve
8	Stroke checking of control valve.
9	Calibration of Transmitter

Syllabus for MICROPROCESSOR LAB

Name of the Course : Diploma in Instrumentation and Control Engineering	
Name of the subject : Microprocessor Lab	
Subject Code:	Semester: Fifth
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	To learn the architecture of Microprocessor
2	To learn programming
Motor Skill	
1	Ability to write program
2	Ability to run it to find output
3	
List of Practical	
Sl No.	Experiments
1	Study of pin configuration of 8085
2	Study of Bus organization of Microprocessor kit (8085) & identification of different Components and their functions.
3	Microprocessor Programming:
	3.1 16 bit arithmetic (addition and subtraction)
	3.2 8 bit multiplication
	3.3 Hex to BCD conversion
	3.4 BCD arithmetic
	3.5 Finding largest & smallest no. From given series
	3.6 Program using stack and subroutine
	3.7 Generation of square wave on SOD pin of 8085
	3.8 Generation of square wave using 8155 timer
	3.9 Program for interfacing of 8255 (keyboard and 7 segment display)
	3.10 Interfacing of ADC
	3.11 Generation of different types of signal using DAC
	3.12 Stepper motor control
	3.13 Serial communication with PC

Syllabus for PROCESS CONTROL LAB

Name of the Course : Diploma in Instrumentation and Control Engineering	
Name of the subject : Process Control Lab	
Subject Code:	Semester: Fifth
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 & transducer for control
2	
Motor Skill:	
1	Accuracy of measurement
2	Proper connection and tuning for control
List of Practical:	
Sl No.	Experiment
1	Temperature control using ON OFF controller, and temperature sensor
2	Level control using D/P transmitter, Single loop controller & control valve
3	Level control using level switch, and controller
4	Flow control using orifice, D/P transmitter, single loop controller, and control valve.
5	Flow control using mass flowmeter, single loop controller and control valve
6	Draw P&I diagram of a specific control loop using ISA symbols
7	Different programming in Ladder for PLC
8	Response of P, I, D and PID Controller for various test inputs (May perform it in simulation)
9	Tuning of controller (May perform it in simulation)

Syllabus for INDUSTRIAL PROJECT & ENTREPRENEURSHIP DEVELOPMENT

Name of the Course : Diploma in Instrumentation and Control Engineering			
Name of the Subject : Industrial Project & Entrepreneurship Development			
Course Code:		Semester: Fifth	
Duration: 6 months		Maximum Marks: 50	
Teaching Scheme: Theory : 2 hrs/week Tutorial : Practical:		Examination Scheme: Continuous Internal Assessment : 25 External Assessment : 25	
Credit: 1			
Aim:			
Sl No.			
1	To develop hands on practice		
2	To develop the mentality to be an entrepreneur		
Objective:			
Sl No.	The Student will able to		
1	Prepare action plan for project work		
2	Identify entrepreneurship opportunity		
3	Acquire entrepreneurial values and attitude		
4	Use the information to prepare project report for business venture		
5	Develop awareness about enterprise management		
Pre-requisite:			
Sl No.			
1	Idea on electronics & electric components		
2	Idea to search internet		
	Idea to visit field		
Contents			
Group	Module	Name of the topic	Hrs/ Module
A	1	Industrial Project: <ul style="list-style-type: none"> Following activities related to project are required to be dealt with, during this semester. Form project batches & allot project guide to each batch. (Max. 5 students per batch) Each project batch should select topic / problem / work by consulting the guide & / or industry. Topic/ Problem / work should be approved by Head of department. Each project batch should prepare action plan of project activities & submit the same to respective guide. Each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project. Action Plan should be part of the project report. Action Plan/ part of project work/full work should be submitted at the end of semester Rest part of project work should be done in sixth semester. Student might complete two projects in two semesters also <p>Project may be ---</p> <ul style="list-style-type: none"> Electronics based 	

- Microprocessor/ Micro controller Based
- PC Based
- Simulation

Here are some example---

- 1 Regulated power supply
- 2 Timers using 555 and other oscillators
- 3 Touch plate switches – transistorized or 555 based
- 4 Door bell/cordless bell
- 5 Clapping switch and IR switch
- 6 Blinkers
- 7 Sirens and hooters
- 8 Single hand AM or FM
- 9 Electronic toy gun, walker, blinkers
- 10 Electronic dice
- 11 Cell charger, battery charger, mobile charger
- 12 Fire/smoke/intruder alarm
- 13 Liquid level controller
- 14 Counters
- 15 Combination locks
- 16 Electronics musical instruments
- 17 Telephone handset
- 18 Audio amplifiers
- 19 Tape recorders
- 20 Automatic stabilizer/CVT
- 21 Emergency light
- 22 Control-panel designing, fabrication and installation
- 23 PC based temperature measurement, display and control using sensor
- 24 Interfacing of various devices with PC and their switching through relays
- 25 Design a parallel port-data acquisition card
- 26 PC as a function generator
- 27 PC based automatic jar filling system
- 28 PC based pressure measurement and control system
- 29 Tele-medicare
- 30 Microprocessor based rolling display/bell and calendar
- 31 Microprocessor based stepper motor control.
- 32 Speed control of DC Machines by Microprocessors.
- 33 Temperature monitoring using microprocessor based systems.
- 34 Microprocessor based liquid level indicator and control/solar tracking system
- 35 Fabrication and assembling of digital clock.
- 36 Design and fabrication of timing circuits using 555 and counters.
- 37 Design and fabrication of amplifiers and oscillators circuits.
- 38 Fabrication of demonstration type Radio receiver
- 39 Fabrication of PCB circuits using ORCAD/Fagu Software.
- 40 Fabrication of ON line/OFF line UPS of different ratings and inverters
- 41 Repair of X-Ray Machines, ECG, EEG, EMG, Calorimeter and Centrifuge etc.
- 42 Repair and fault location of telephone exchanges and intercom system.
- 43 Repair of oscilloscope, function generator, Power supply
- 44 Design and developing web sites of organizations
- 45 Installation of computer network (LANS).
- 46 Microprocessor based solar tracking system
- 47 Car or home security system
- 48 Bank token display
- 49 Printer sharing unit
- 50 Caller Identification unit for phone

		51 LCR-Q meter and frequency meter 52 MP-Based A/D converter 53 MP-Based D/A converter 54 Line Follower Robot	
	2	Seminar: Seminar on any relevant latest technical topic based on latest research, recent trends, new methods and developments in the field of sensors & transducers, control, Electronics, Microprocessor & Microcontroller or on any other topics on Instrumentation .	
B	3	Entrepreneurship, Creativity & Opportunities 3.1 Concept, Classification & Characteristics of Entrepreneur 3.2 Creativity and Risk taking. a. Concept of Creativity & Qualities of Creative person. b. Risk Situation, Types of risk & risk takers. 3.3 Business Reforms. a. Process of Liberalization. b. Reform Policies. c. Impact of Liberalization. d. Emerging high growth areas. 3.4 Business Idea Methods and techniques to generate business idea. 3.5 Transforming Ideas in to opportunities transformation involves Assessment of idea & Feasibility of opportunity 3.6 SWOT Analysis	
	4	Information And Support Systems 4.1 Information Needed and Their Sources: Information related to project, Information related to support system, Information related to procedures and formalities 4.2 Support Systems a. Small Scale Business Planning, Requirements. b. Govt. & Institutional Agencies, Formalities c. Statutory Requirements and Agencies.	
	5	Market Assessment 5.1 Marketing -Concept and Importance 5.2 Market Identification, Survey Key components 5.3 Market Assessment	
	6	Business Finance & Accounts 6.1 Business Finance a. Cost of Project i. Sources of Finance ii. Assessment of working capital iii. Product costing iv. Profitability v. Break Even Analysis vi. Financial Ratios and Significance 6.2 Business Account a. Accounting Principles, Methodology i. Book Keeping ii. Financial Statements iii. Concept of Audit	
	7	Business Plan & Project Report 7.1 Business plan steps involved from concept to commissioning Activity Recourses, Time, Cost	

		<p>7.2 Project Report</p> <p>a. Meaning and Importance</p> <p>b. Components of project report/profile (Give list)</p> <p>7.3 Project Appraisal</p> <p>a. Meaning and definition</p> <p>b. Technical, Economic feasibility</p> <p>c. Cost benefit Analysis</p>	
8		<p>Enterprise Management And Modern Trends</p> <p>8.1 Enterprise Management:</p> <p>a. Essential roles of Entrepreneur in managing enterprise</p> <p>b. Product Cycle: Concept and importance</p> <p>c. Probable Causes Of Sickness</p> <p>d. Quality Assurance: Importance of Quality, Importance of testing</p> <p>8.2 E-Commerce: Concept and Process</p> <p>8.3 Global Entrepreneur</p> <p>a. Assess yourself-are you an entrepreneur?</p> <p>b. Prepare project report and study its feasibility.</p>	

Books:

Title	Author	Publisher
Entrepreneurship Theory and Practice	J. S. Saini, B. S. Rathore	Wheeler Publisher
Entrepreneurship Development	E. Gorden, K. Natrajan	Himalaya Publishing
Entrepreneurship Development	Prepared by Colombo plan staff college for Technician Education.	TMH
Measurement & Metrology	A K Sawhney & M Mahajan	Dhanpat Rai & Co.
Digital Electronics & Logic Design	Joydeep Chakraborty	University Press
Wireless Sensor Networks	S Anandamurugan	University Science Press
A guide to Wireless Sensor Networks	S Swapna Kumar	University Science Press
Intelligent Instrumentation for Engineers	J B Dixit & Amit Jadan	University Science Press (Laxmi Publications Pvt. Ltd)
A Manual on How to Prepare a Project Report	J.B.Patel, D.G.Allampally	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat, India Ph. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
A Manual on Business Opportunity Identification & Selection	J.B.Patel, S.S.Modi	
National Directory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen, H. Anil Kumar	
New Initiatives in Entrepreneurship Education & Training	Gautam Jain, Debmuni Gupta	
A Handbook of New Entrepreneurs	P. C. Jain	

Video Cassetts

Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
Assessing Entrepreneurial Competencies	
Business Opportunity Selection and Guidance	
Planning for completion & Growth	
Problem solving-An Entrepreneur skill	

Glossary:**Industrial Terms**

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

Components of Project Report:

1. Project Summary (One page summary of entire project)
2. Introduction (Promoters, Market Scope/ requirement)

Syllabus for PROFESSIONAL PRACTICE III

Name of the Course : Diploma in Instrumentation and Control Engineering		
Name of the Subject : Professional Practice III		
Subject Code:	Semester: Fifth	
Duration: 6 months	Maximum Marks: 50	
Teaching Scheme: Theory : 1 hr/week Tutorial : Practical: 2 hrs/week	Examination Scheme: Continuous Internal Assessment: 50	
Credit: 1		
Aim:		
1	To acquire information from different sources	
2	To present given topic in a seminar	
3	To Prepare a report on industrial visit, expert lecture	
4	To introduce FOSS	
Objective:		
Sl No.	The Student will able to	
1	Prepare a report on industrial visit	
2	Acquire information from different sources.	
3	Prepare notes for given topic.	
4	Present given topic in a seminar.	
5	Interact with peers to share thoughts.	
6	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 basic computer operation	
4	Idea of industrial visit	
Contents		
Unit	Name of the activity	Hrs/Unit
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	<p>Field Visit/ Training</p> <p>2.1 One or two week Vocational Training / Industrial Training to any industry like cement industry, Chemical Industry, Petrochemical Industry, Oil Refinery, Water Treatment Plant etc.</p> <p>2.2 One copy of training report should be submitted to the department of the college</p>	
3	<p>Lecture by Professional / Industrial experts / Student Seminar based on following areas (any two)</p> <ul style="list-style-type: none"> • Environmental pollution and control • Renewable energy sources • Safety in Industry • Health Awareness- AIDS • Basic Touch Sensor Screen System • Fieldbus technology • Bluetooth technology • Any other suitable topic 	
4	<p>Group Discussion</p> <p>The student should discuss in a group of six to eight students. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are-</p> <ul style="list-style-type: none"> • Sports • Current news items • Child labor • Child abuse & exploitation against women • Road safety rules awareness • Balance between professionalism and family • Rain water harvesting • Globalization • Commercialization of Health care • Can Business and Ethics run together? • To save our culture Fashion show and New year party should be banned • Ethics should be taught as a general subject • Any other suitable topic 	
05	<p>Free & Open Source Software</p> <p>Introduction and Installation Of LaTeX and Compilation</p> <p>5.1 Installation Of MikTeX in the Windows Operating Systems</p>	
	<p>5.2 Installation of TeXnic Center in Windows OS</p> <p>5.3 Compilation</p> <p>5.4 How to use TeXnic Center help while compiling a file.</p> <p>5.5 Letter writing in LaTeX</p> <p>5.6 Report Writing in LaTeX</p> <p>5.7 Mathematical Typesetting in LaTeX</p> <p>5.8 Equations in Latex</p> <p>5.9 Report Writing in LaTeX</p> <p>5.10 Table and Figures in LaTeX</p> <p>5.11 How to create references in LaTeX document</p>	
Books:		
Title	Author	Publisher
Quantitative Aptitude & Reasoning	R. V. Praveen	PHI
Microprocessor& Microcontroller	N Senthil	Oxford University press
Microprocessor and Microcontroller	Kumar, Saravanan, Jeevananthan	Oxford University Press