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: THIRD

BRANCH: ENGINEERING

SR. NO.	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR	@TW	Total Marks
						TA	CT	Total				
1.	**Analog Electronics & Fundamentals**	**4**	**3**	**1**	**-**	**10**	**20**	**30**	**70**	**-**	**-**	**100**
2.	**Circuit Theory**	**3**	**2**	**1**	**-**	**10**	**20**	**30**	**70**	**-**	**-**	**100**
3	**Fundamentals of Instrumentation**	**3**	**3**	**-**	**-**	**10**	**20**	**30**	**70**	**-**	**-**	**100**
4.	**Basic Control System**	**2**	**2**	**1**	**-**	**5**	**10**	**15**	**35**	**-**	**-**	**50**
5.	**Electrical Measurement & Measuring Instruments**	**2**	**2**	**-**	**-**	**5**	**10**	**15**	**35**	**-**	**-**	**50**
6	**Electrical Machine**	2	**2**			**5**	**10**	**15**	**35**			**50**
7.	**Analog Electronics & Fundamentals Laboratory**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**100**	**-**	**100**
8	**Circuit Theory Laboratory**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**100**	**-**	**100**
9.	**Electrical Measurement & Measuring Instruments Laboratory**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**50**	**-**	**50**
10.	**Machine Laboratory**	**1**	**-**	**-**	**2**	**-**	**-**		**-**	**50**	**-**	**50**
11.	**Environmental Studies**	-	1								**50**	
12.	**Professional Practice – I**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**50**	**50**
	Total	**25**	**15**	**3**	**12**	**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 Analog Electronics & Fundamentals

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the subject : **Analog Electronics & Fundamentals**	
Subject Code:	Semester: Third
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	This subject intends to teach operating principle and application of electronic circuits and devices like different types of amplifiers, oscillators and their applications
2	The subject knowledge is required in Applied Electronics, 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	do proper biasing for transistor
2	classify and explain various amplifiers and Oscillator circuits based on their characteristics
3	understand the operation and application of differential amplifier and operational amplifier
Pre-requisite:	
Sl No.	
1	Basic Electronic Engineering
2	Basics on different active and passive components

Group	Module	Topics	No. of classes per module
A	I	**Zener Diode**: 1. Construction, symbol, Characteristics, biasing, specification and application of zener diode. Specifications and examples of zener diode.	02
	II	**Bipolar Junction Transistor**: 1. Construction and operation of NPN and PNP transistor. 2. Cut-off and saturation, V-I characteristics of transistor in CE, CB and CC configuration. Definition of current gains and their relationships for three configurations. 3. Application of transistor as amplifier and switch. Specifications and examples of transistors	06
	III	**Field Effect Transistor:**	04

		1. Construction and operation, V-I characteristics, parameters and application of JFET. 2. Construction and operation, V-I characteristics of E-MOSFET, DE-MOSFET, CMOS. 3. Difference between BJT and JFET. 4. Examples of JFET and MOSFET.	
	IV	**Uni junction Transistor:** 1. Construction and operation and characteristics of UJT. 2. Application of UJT as relaxation oscillator. 3. Example of UJT.	02
B	IV	**Transistor Biasing:** 1. Idea on faithful amplification, stabilization. 2. Need for transistor biasing, stability factor, concept of DC load line, selection of Q point. 3. Different methods of transistor biasing (base resistor/ fixed biased, emitter bias, collector feedback bias, self bias) with stability analysis. 4. Thermal run away and its prevention, heat sinks.	08
	V	**Small Signal Amplifier:** 1. Graphical demonstration of single stage amplifier, phase reversal, DC and AC equivalent circuit, load line.	03
	VI	**Feedback Amplifier and Oscillator:** 1. Concept of positive and negative feedback. 2. Amplifier without and with feedback. 3. Advantage of negative feedback on voltage gain, bandwidth, input and out impedance, stability, noise and distortion. 4. Classification of oscillators, principle of oscillations, damped and un-damped oscillation, use of positive feedback, barkhausen criterion for oscillation. 5. Operation, frequency of oscillation of Wien bridge oscillator.	10
	VII	**Operation Amplifier:** 1. Op-amp configurations (building blocks), op-amp parameters, characteristics of an ideal op-amp. 2. Examples of IC op-amp. 3. Application of op-amp as inverting amplifier, non-inverting amplifier, adder, subtractor, differentiator, integrator, unity gain buffer, V to I and I to V converter, comparator, re-generative comparator	10

		(Schmitt trigger) and instrumentation amplifier.	

Books:		
Title	**Author**	**Publisher**
Basic Electronics	Subhadeep Choudhury	Dhanpat Rai & Co (P) Ltd
Basic Electronics	De	Pearson Education
Principle of Electronics	V K Mehta	S. Chand & Co.
Electronic Principle	A.P. Malvino	McGraw-Hill
Electronic Devices & Circuits	Millman & Halkias	McGraw-Hill
Basic Electronics & Linear Circuits	Bhargava	McGraw-Hill
Electronic devices & Circuit Theory	Boylestad & Nashalsky	Pearson Education
Electronic Fundamentals & Applications	D. Chattopadhyay & P.C. Rakhshit	New Age 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	I	12	Any 20	1	1 x 20 =20	3	Any 5 taking at least 2 from each group	10	10 x 5 =50
	II								
	III								
B	IV	13				5			
	V								
	VI								
	VII								

Syllabus for BASIC CONTROL SYSTEM

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Basic Control System**	
Subject Code:	Semester: Third
Duration: 6 months	Maximum Marks: 50
Teaching Scheme: Theory : 2 hrs/week Tutorial : 1hrs/week Practical:	Examination Scheme: Internal Scheme : Teachers Assessment: 05 Class Test : 10 End Semester Exam : 35
Credit: 4	

Aim:	
Sl No.	
1	Monitoring and control of process is the most important part in industry. With knowledge of this subject students will be able to know whether a control system is stable or not and how the system be stable by changing the process parameters and gain.

Objective:	
Sl No.	The Student will able to
1	Know basics of control system
2	Perform response analysis of first and second order system
3	Analyze the stability of different system
4	Plot root locus of different system

Pre-requisite:	
Sl No.	
1	Fundamental idea on instrumentation
2	Knowledge of mathematical calculation (Laplace Transform and Differential equations)
3	Knowledge of basic Electronics

Contents

Module		Topics	No. of classes per module
A	I	**Mathematical Models of Physical System**: 1. Concept of physical system, physical model and mathematical model. 2. Mechanical system – translator (mass-spring-dashpot system) system and rotational system. 3. Electrical system – RLC series and RLC parallel system. 4. Concept of transfer function. 5. Block diagram representation, block diagram reduction techniques – simple problems. 6. Signal flow graph representation, Mason's gain formula – simple problems.	12
	II	**Time Domain Analysis:** 1. Concept of characteristics equations, poles, zeros, types of systems and order of systems. 2. Standards signals – step, ramp, parabolic and impulse. 3. Error constants – position, velocity and acceleration. 4. Time response of first order system – time constants and steady state error. 5. Time response of second order system – rise time, peak time, peak overshoot and setting time.	08

B	III	**Stability Analysis:** 1. Concept of stability and S-plane, stability criterions. 2. Different techniques used for stability analysis in time domain (only names). 3. Routh Stability Criterion. 4. Simple problems.	06
	IV	**Root Locus Analysis:** 1. Concept of root locus. 2. Construction rules of root locus. 3. Simple problems.	04

Books:

Title	**Author**	**Publisher**
Process Control Principle & Application	S Bhanot	Oxford University Press
Modern Control Engineering	Ogata	PHI
Automatic Control System	Kuo	Wiley India
Modern Control System	Ogata	PHI
Control System Theory	S Dasgupta	Khanna

End Semester Examination Scheme

Maximum Marks: 70						Time: 3 Hrs			
		Objective Questions				**Subjective Questions**			
Group	Module	To be set	To be	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	5	5 x 5 =25
	2								
B	3	6				4			
	4								

Syllabus for ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

Name of the Course : Diploma in Instrumentation & Control Engineering				
Name of the Subject : **Electrical Measurement & Measuring Instruments**				
Subject Code:			Semester: Third	
Duration: 6 months			Maximum Marks: 50	
Teaching Scheme: Theory : 2 hrs/week Tutorial : Practical: 2 hrs/week			Examination Scheme: Internal Scheme : Teachers Assessment: 05 Class Test : 10 End Semester Exam : 35	
Credit: 2				
Aim:				
1	Diploma holders need to measure various electrical quantities with electrical measuring instruments. So electrical parameter measurement is important.			
2	Measurements of various electrical quantities are needed for testing, monitoring, maintenance, and controlling the process. In addition to this, student must know the calibration techniques and extension of meter ranges. Therefore Electrical Measurement skills are very important. Accuracy of measurement is one of the main parameters in industrial processes as ability of control depends upon ability to measure.			
3				
Objective:				
Sl No.	The Student will able to			
1	Identify the measuring instruments used for measuring electrical quantities			
2	Select appropriate measuring instrument with range for measurement of various electrical quantities.			
3	Select and use range of multiplier			
	Select appropriate instrument for measuring power and energy			
	Classify measuring instruments based on construction, principle of operation and quantity to be measured, types of error			
	Calibrate various types of instruments			
Pre-requisite:				
1	Basic idea on electrical technology			
2	Knowledge of current, voltage, power etc			
Contents				
Group	**Module**	**Name of the topic**	**Hrs/ Module**	**Marks**
A	01	**Fundamentals of Measurements:** 1.1 Purpose and significance of measurement. 1.2 Various effects of electricity employed in measuring instruments 1.3 Desirable qualities of measuring instruments 1.4 Classification of instruments 1.5 Types of errors 1.6 Different types of torque in analog instruments	4	
	02	**D'Arsonaval Galvanometer:** 2.1 Construction, working principle, Deflecting torque equation 2.2 Applications 2.3 Scale shape, damping arrangement, shunt, swamping resistance.	3	
	03	**Measurement of Voltage & Current :** 3.1 Construction, working principle, torque equation, scale shape, sources of error, merits & demerits, & applications of a. Permanent Magnet Moving Coil Instrument, b. Electrodynamics instrument, c. Moving Iron instrument, 3.2 Extension of instrument ranges: shunts & multipliers.	7	

B	04	**Measurement of Power & Energy:** 4.1 Construction & working principle of – a. Single-phase dynamometer type wattmeter, b. Induction type Watt-hour meter (single phase). 4.2 Errors & adjustments of those 4.3 Advantages & disadvantages.	7	
	05	**Measurement of Circuit Parameters :** 5.1 Classifications of low, medium, high resistance. 5.2 Measurement of Resistance by Wheatstone bridge, Kelvin Double Bridge & Megger 5.3 Wien's Bridge 5.4 Maxwell's Bridge 5.5 Schering Bridge 5.6 Hay bridge 5.7 De-sauté bridge	9	

Books:

Title	Author	Publisher
A course in Electrical & Electronics Measurement & Instrumentation	A.K. Sawhney	Dhanpat Rai & Co.
A Course in Electrical & Electronics Measurement & Instrumentation	J.B. Gupta	S. K.Kataria & Sons
Electrical Measurements & Measuring Instruments	Golding & Widdis	A H Wheeler
Electrical & Electronics Measurements and Instrumentation	Purkait, Biswas, Das, Koley	McGraw Hill Education

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	8	Any 10	1	1 x 10 = 10	5	Any 5 taking at least 2 from each group	5	5 x 5 = 25
	2								
	3								
B	4	5				3			
	5								

Note: Above syllabus is same as that of Diploma in Electronics & Instrumentation Engineering(3rd Semester)

Syllabus for CIRCUIT THEORY

Name of the Course : Diploma in Instrumentation & Control Engineering				
Name of the Subject: **Circuit Theory**				
Subject Code:			Semester: Third	
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:				
1	This subject find utility in understanding the concept in dc and ac response of different network and electric circuit.			
Objective:				
Sl No.	The Student will able to			
1	use network theorem for solution of DC network			
2	interpret the response of R,L,C elements to AC supply			
3	calculate various parameters of AC circuits			
4	interpret AC series and parallel circuits			
5	have clear conception of series and parallel resonance, calculate resonance frequency in series & parallel circuits and explain the method of attaining resonance in them			
6	calculate Quality Factor, selectivity and band-width in both series & parallel resonance circuit, voltage magnification in series circuit and current magnification in parallel circuit			
7	understand the meaning of acceptor and rejector circuits			
8	state the applications of series & parallel resonance circuits and be able to compare them			
9	define and state properties of Laplace Transformation			
10	understand the operations and characteristics of different kinds of Filter Circuits			
11	understand and explain Two-port networks			
12	understand short circuit and open circuit parameters			
13	Calculate short circuit and open circuit parameter for simple circuit			
Pre-requisite:				
1	Idea on component used in circuit			
2	knowledge of complex algebra and knowledge of operator 'j'			
	Contents			
Group	**Module**	**Name of the topic**	**Hrs/ Module**	**Marks**
A	01	**Network Theorem in dc Circuits:** Statement, explanation, limitation & problems on 1.1 Thevenin's theorem, 1.2 Norton's theorem 1.3 Superposition theorem 1.4 Maximum power transfer theorem. 1.5 Star-delta conversion	8	
	02	**A. C. Fundamentals & Sinusiodal Steady State Analysis:** 2.1 Definitions & explanation of Active & Passive elements. 2.2 Concept of complex impedance, Rectangular & polar form. Simple problem. 2.3 Idea on Apparent, real , and active power. 2.4 Sinusiodal response of a series RLC circuit 2.5 Sinusiodal response of a parallel RLC circuit	8	

B	03	**Resonance:** 3.1 Series Resonance: Properties, Impedance, Phase angle, Voltages, Current, Resonant frequency in series resonant circuit. Variation of voltage, current, Resistance, inductive & capacitive reactance, power factor with frequency, Explanation of half power frequencies, Quality factor, Selectivity, Bandwidth, Voltage Magnification, Acceptor Circuit, Simple problem. 3.2 Parallel Resonance: Properties, Impedance & Phase angle, Voltages, Current, Resonant frequency in parallel resonant circuit / Tank circuit. Variation of voltage, current, Resistance, inductive & capacitive reactance, power factor with frequency. Explanation of Quality factor, Selectivity, Bandwidth, Current magnification Magnification, Rejector Circuit, Simple problem. 3.3 Comparison between series & parallel resonance.	13	
	04	**Passive Filter:** 4.1 Idea of Passive & Active Filter, Their relative advantages and disadvantages 4.2 Idea of Fourier Series & frequency spectrum. (concept only) 4.3 Construction, Principle of operation, Characteristics of Low pass, High pass, Band pass & Band stop filter. 4.4 Design of Low pass filter & High pass filter (Constant K type only). Numerical problems on them. 4.5 Composite filter (concept only).	11	
C	05	**Laplace Transformation:** 5.1 Definition & properties of LT 5.2 Laplace Transform of unit step, impulse, ramp, exponential, sine, cosine, pulse, impulse, Dirac delta function. 5.3 Explanation of Laplace Transform theorems like Differential, integral, Time displacement, initial value & final value. 5.4 Inverse Laplace Transformation. Simple problem 5.5 Application of Laplace transformation in circuit theory	12	
	06	**Two Port Network:** 6.1 Idea on Linear & Non linear networks, Unilateral & Bilateral networks 6.2 Explanation of Z parameter (Open Circuit Impedance Parameter) 6.3 Explanation of Y parameter (Short Circuit Admittance Parameter) 6.4 Explanation of h -parameter (Hybrid Parameter) 6.5 Interrelation of above parameters 6.4 Simple problem on above parameters.	8	

Books:

Title	Author	Publisher
Circiut Theory (Analysis & Synthesis)	A. K. Chakraborty	Dhanpat Rai & Co
Electric Circuit Analysis	Kumar	Pearson Education
Introduction to Electric Circuits	Dorf	Wiley
Network Theory: Analysis & Synthesis	Ghosh	PHI
Circuit Theory	S. Salivahanan, S. Pravin Kumar	Vikas
Fundamentals of Electric Circuit	Alexander	Mc Graw Hill
Electric Circuit	David A. Bell	Oxford
Circuits & Network	Sukhua, Nagsarkar	Oxford
A Text Book of Electrical Technology Part-I	B.L. Thereja	S. Chand &. Co
Electric Circuit Analysis	P Ramesh Babu	Scitech
Electric Circuit Theory	Chattopadhyay, Rakshit	S. Chand &. Co
Circuit Network	A. Dani	BPB
Network Analysis & Synthesis	R R Singh	Mc Graw Hill

Electric Circuit Analysis	S.N. Sivanandam	Vikas

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	7	Any 20	1	1 x 20 =20	2	Any 5 taking at least 1 from each group	10	10 x 5 =50
	2								
B	3	9				3			
	4								
C	5	9				3			
	6								

Note: Above syllabus is same as that of Diploma in Electronics & Instrumentation Engineering(3rd Semester)

Syllabus for FUNDAMENTALS OF INSTRUMENTATION

Name of the Course : Diploma in Instrumentation & Control Engineering				
Name of the Subject : **Fundamentals of Instrumentation**				
Subject Code:			Semester: Third	
Duration: 6 months			Maximum Marks: 100	
Teaching Scheme: Theory : 3 hrs/week Tutorial : Practical: 3hrs/week			Examination Scheme: Internal Scheme : Teachers Assessment: 10 Class Test : 20 End Semester Exam : 70	
Credit: 3				
Aim:				
1	As a core technology subject, it intends to teach the basics of instrumentation system, operating principle and application of basic sensors and their use in Instrumentation system			
2	The subject knowledge is required in measurement and transmission the signal to control of process parameter			
3	Understanding the subject will provide skill to the students to communicate the sensing system to display with signal conditioning part.			
Objective:				
Sl No.	The Student will able to			
2	Get idea what is Instrumentation			
2	Know different subsystems required in a complete instrumentation system			
4	Get idea on different important parameter/ specification & characteristic of instruments			
5	Idea of different sensors and transducers for given application			
6	Know the principle of operation, advantages, disadvantages of different process parameter like velocity, acceleration , torque, density viscosity			
7	Select appropriate data transmission system			
8	Idea on Pneumatic system			
9	Know different recording instrument used to record different process parameters			
Pre-requisite:				
Sl No.				
1	Basic knowledge on Resistance, Capacitance, Inductance			
2	Basic idea on electronic components			
Contents				
Group	**Module**	**Name of the topic**	**Hrs/ Module**	**Marks**
A	01	**Principles of Instrumentation:** 1.1 Basic concepts of Instrumentation, block diagram of generalised measurement system, function of different components, basic idea of electronic & pneumatic instrumentation. 1.2 Performance Characteristics of Instruments : Specification, range, sensitivity, accuracy, precision, error, drift, threshold, resolution, hysteresis, correction, span, linearity, repeatability, reproducibility, speed of response, lag, fidelity, static & dynamic	6	

		characteristics (Definition with brief explanation only) 1.3 Errors in Measurement: types of error, normal distribution of errors. 1.4 Concept of calibration.		
	02	**Sensors & Transducers** 2.1 Definition of sensors & transducers, difference between sensor & transducer, factors governing the choice of transducer, 2.2 Classification of Transducer : Primary & Secondary, Electrical & Mechanical, Analog & Digital, Active & Passive. 2.3 Description of the following transducers: Resistance type (potentiometric, strain gauge), Inductance type (LVDT), RVDT, Capacitive type, Piezoelectric type, Magneto-strictive type, Hall effect type. 2.4 Radiation Detectors : photovoltaic ell, photo emissive tube, photomultiplier tube	10	
	03	**Recording & Display System** 3.1 Necessity of Recorders in Instrumentation system 3.2 Classification of Recorders 3.3 Explanation of XY, Strip chart recorder, magnetic tape recorder 3.4 Basic concept of data logger, TFT, LED, LCD display, sequential display using LED, Dot matrix display	6	
B	04	**Measurement of Velocity, Acceleration & Torque:** 4.1 Tacho generators, tacho meters, stroboscope, encoders, 4.2 Seismic accelerometers, piezoelectric accelerometer. 4.3 Torque measurement of rotating shaft using strain gauge, optical methods, magnetostrictive methods.	10	
	05	**Measurement of Density & Viscosity** 5.1 Definition and unit of density & viscosity 5.2 Density measurement for constant level & varying level application 5.3 Principle, advantage, disadvantage of Oscillating U tube/ coriolis, hydrometer, pycnometer type density measurement 5.4 Continuous online density measurement 5.5 Viscosity measurement by Viscometer method (rotational, Capillary, Vibratory), Ultrasonic pulse echo method	9	
	06	**Basics of Pneumatic System** 6.1 Advantages and limitations of pneumatic system 6.2 Construction, characteristic & application of Flapper-Nozzle assembly. 6.3 Pneumatic Relay, Filter, Regulator 6.4 Explanation of Pneumatic Transmitter	4	

Books:

Title	Author	Publisher
Principles of Industrial Instrumentation	D. Patranabis	TMH
Fundamentals of Industrial Instrumentation	A Barua	Wiley India Pvt Ltd
Instrumentation Devices & System	Rangan, Sarma, Mani	Mc Graw Hill
Sensors & Transducers	D. Patranabis	PHI
Measurement System Application & Design	E.O. Doeblin	Mc Graw Hill
Principles of Measurement & Instrumentation	Alan S. Morris	PHI

Instrumentation for Engineering Measurement	Dally	Wiley India Pvt Ltd
Introduction to Measurement & Instrumentation	Ghosh	PHI
Transducer for Instrumentation	M G Joshi	Laxmi Publications
Process Control Instrumentation Technology	Kartis Johnson	PHI
Sensors & Transducers	Sinclair	Yes Dee Publishing

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	4	Any 5 taking at least 2 from each group	10	10 x 5 =50
	2								
	3								
B	4	10				4			
	5								
	6								

Note: Above syllabus is same as that of Diploma in Electronics & Instrumentation Engineering(3rd Semester)

Syllabus for ELECTRICAL MACHINE

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Electrical Machine**	
Subject Code:	Semester: Third
Duration: 6 months	Maximum Marks: 50
Teaching Scheme: Theory : 2 hrs/week Tutorial : Practical: 2 hrs/week	Examination Scheme: Internal Scheme : Teachers Assessment: 05 Class Test : 10 End Semester Exam : 35
Credit: 2	
Aim:	
Sl No.	
1	Students will be able to analyze the characteristics of DC motor, Transformers & qualitative parameters of these machines.
2	This machines are used in the process plant. Knowledge gained by the students will be helpful to work in different control system in process plant.
3	The knowledge and the skill obtained will be helpful in discharging duties such as supervisor, controller & R&D technicians.
Objective:	
Sl No.	The Student will able to
1	Know the constructional details & working principles of DC machines & transformers
2	Test motors & transformers
3	Evaluate the performance of transformer by conducting various tests
4	Write the specification of DC machine & transformer as per requirement
5	Decide the suitability of dc generator motor & transformer for particular purpose
6	Operate any machine properly.
Pre-requisite:	
1	Basic Electrical Engineering

2	Basic Electronic Engineering			
		Contents		
Group	**Module**	**Name of the topic**	**Hrs/ Module**	**Marks**
A	1	**Transformer** 1.1 Construction & working principle of transformer. 1.2 EMF equation of transformer, transformation ratio, turn ratio, transformer rating, Simple problem 1.3 Transformer on No Load & on Load 1.4 Open & short circuit test 1.5 Losses & efficiency of transformer, voltage regulation. 1.6 Principle, advantage & disadvantage of Single phase auto-transformer, Current & Potential transformer, their characteristics. 1.7 Specification of a transformer.	5	
B	2	**D.C. Generator** 2.1 Construction & working principle of D. C. Generator, EMF equation. 2.2 Excitation system, types of D.C. Generator, terminal voltage, losses & efficiency, Specification of DC machine.	3	
	3	**D. C. Motor** 3.1 Construction & working principle of D. C. Motor. 3.2 Type of motors & their uses 3.3 Explanation of D.C. Motor starters, necessity of starters, types of starters. 3.4 Speed control of DC Motor by field flux control & armature voltage control of dc shunt motor. 3.5 Basic idea of enclosure of motor. 3.6 Simple concept of BLDC motor.	8	
C	4	**Synchronous Generator (Alternator)** 4.1 Construction, Working principle, 4.2 Relation between speed & frequency, 4.3 Pitch factor, Distribution Factor (No derivation required), 4.4 Emf equation of alternator, Simple Problem 4.5 Alternator on No Load & on load, 4.6 Conception on efficiency 4.7 Voltage Regulation (Only definition)	6	
	5	**A. C. Motors** 5.1 Induction Motor: construction, types of rotor, rotating magnetic field, principle of operation of three phase induction motor. 5.2 Synchronous speed, actual speed & slip, torque equation, factors affecting the motor -torque, speed torque characteristics. 5.3 Starting methods of induction motor by using DOL & Star-Delta starter, basic idea of soft starter. 5.4 Speed control of AC induction motor by variable frequency & variable voltage (V/F) control.	8	

Books:

Title	Author	Publisher
A Text Book of Electrical Technology Part-II	B.L. Thereja	S. Chand &. Co
Electrical Technology Vol2:Machines & Measurement	S.P. Bali	Pearson Education
Electrical Technology	E. Huges	Longman
Electrical Technology	H. Cotton	CBS Publisher
Electrical Machine Design	A K Sahwney	Dhanpat Rai & Co (P) Ltd
Induction & Synchronous Machine	K Murgesh Kumar	Vikas
Electrical Machines	Samarjit Ghosh	Pearson Education
Electrical Machine	P K Mukherjee	Dhanpat Rai Publishing Co (P) Ltd
DC Machine & Transformer	K Murgesh kumar	Vikas
Electrical Machine	S K Bhattachaya	Mc Graw Hill
Electrical Machine	R.K. Rajput	Laxmi 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	2	Any 10	1	1 x 10 = 10	2	Any 5 taking at least 1 from each group	5	5 x 5 = 25
B	2	5				3			
	3								
C	4	6				3			
	5								

Note: Above syllabus is same as that of Diploma in Electronics & Instrumentation Engineering(3rd Semester)

Syllabus for Analog Electronics & Fundamentals Laboratory

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the subject : **Analog Electronics & Fundamentals Laboratory**	
Subject Code:	Semester: Third
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 locate fault in circuit
2	Interpret the waveform
Motor Skill	
1	Ability to sketch circuits
2	Ability to interpret circuit
List of Practical	
Sl No.	**Experiments**
1	Identification &testing of different passive and active circuit elements & to know their symbols: Resistor(by using colour code & by using multimeter) capacitor, inductor, transformer, relay, switches, batteries/cells, diode/Zener diode, transistors, SCR,
2	To plot forward and reverse biased characteristics of zener diode
3	To study a Zener Diode based voltage regulator
4	Experiment for input /output characteristics of BJT
5	Experiment for input & transfer characteristics of FET.
6	Design of Wien bridge oscillator for a given cut off frequency
7	Use of op-amp as – Non inverting amplifier. Inverting amplifier. Buffer. Adder. Differentiator. Integrator.
8	Design of Low pass & High pass active filter & plotting of frequency response
	Note: Connect the circuit on bread board and see the response on CRO. Prepare the Labsheet.

Syllabus for CIRCUIT THEORY LABORATORY

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Circuit Theory Laboratory**	
Subject Code:	Semester: Third
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	Interpret results
2	Calculate values of various components for given circuits
3	Select instrument

Motor skill:	
1	Connect the instrument properly
2	Take accurate readings
List of practical:	
Sl No.	**Experiment**
01	Verification of- Superposition theorem. Thevenin's theorem. Norton's theorem. Maximum power transfer theorem.
02	To observe an AC wave form on CRO and calculate its average & RMS values, frequency, time period
03	Analysis of charging & discharging of RC circuit with CRO (calculation of time constant, rise time).
04	Design of series resonance circuit with a particular cut of frequency and to plot frequency response
05	Design of parallel resonance circuit with a particular cut of frequency and to plot frequency response
06	Designing of (considering cut-off frequency) Low pass filter and to plot frequency response..
07	Designing of (considering cut-off frequency) High pass filter to plot frequency response.

Syllabus for **ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS LABORATORY**

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Electrical Measurement & Measuring Instruments Laboratory**	
Subject Code:	Semester: Third
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**:** 2	
Skill to be developed:	
Intellectual Skill:	
1	Identification of Instruments
2	Selection of Instruments and equipments for measurement
3	
Motor skill:	
1	Accuracy in measurement
2	Making proper connection

List of practical	
Sl No.	**Experiments**
01	Measurement of current and voltage by low range ammeter and voltmeter respectively with shunt and multiplier
02	Measurement of medium valued resistance by Wheat stone bridge method.
03	Measurement of low valued resistance by Kelvin's double bridge.
04	Measurement of insulation resistance by Megger.
05	Extension of range of ammeter & voltmeter.
06	Measurement of power & PF by Wattmeter for a load like fluorescent lamp.
07	Measurement of Circuit Parameter using
	7.1 Wein Bridge
	7.2 Maxwell's Bridge
	7.3 Schering Bridge
	7.4 Hay Bridge
	7.5 De Saute Bridge

Syllabus for **ELECTRICAL MACHINE LABORATORY**

Name of the Course : Diploma in Instrumentation & Control Engineering	
Name of the Subject : **Electrical Machine Laboratory**	
Subject Code:	Semester: Third
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**:** 2	
Skill to be developed:	
Intellectual Skill:	

1	Identification of DC/AC machine, motor, transformer
2	
3	
Motor skill:	
1	Accuracy in measurement
2	Making proper connection
List of practical	
Sl No.	**Experiments**
1	To identify the construction details of D.C. machine
2	To identify the construction details of A.C. synchronous machine and asynchronous machine
3	Starting and reversing of DC shunt motor
4	Speed control of D.C. shunt motor by- (a) Armature voltage control. (b) Field flux control.
5	Measurement of performance of single phase transformer by conducting O.C. and S.C. test
6	Speed control of AC induction motor by V/F drive

Syllabus for PROFESSIONAL PRACTICE I

Name of the Course : Diploma in Instrumentation & Control Engineering		
Name of the Subject : **Professional Practice I**		
Subject Code:		Semester: Third
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 or competitive tests	
2	The purpose of introducing professional practice is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lecturers, seminars on technical topics and group discussions are planned in a semester so that there will be increased participation of students in learning process	
3	To introduce FOSS	
Objective:		
Sl No.	The Student will able to	
1	Prepare a report on industrial visit	
2	Prepare notes for given topics	
3	Present given topic in a seminar	

4	Interact with peers to share thought
5	Operate LibraOffice software

Pre-requisite:	
1	Knowledge on basic electrical & electronic engineering
2	Knowledge on Instrumentation engineering
	Knowledge of basic computer operation

Contents

Unit	**Name of the activity**	**Hrs/Unit**
01	**Field Visit** Structured field visit (at least one) should be arranged and report 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) Nearby Petrol Pump (fuel, oil, product specification) b) Automobile Service Station (Observation of components / aggregates) c) Dairy Plant / Water Treatment Plant d) Power supply/ UPS/SMPS/ Inverter manufacturing unit e) Electronic Instrument calibration laboratory f) Any other plant	10
02	**Lecture by Professional / Industrial experts / Student Seminar** Some of the suggested topics are,	8
	a) Pollution Control b) Illumination & lighting System c) Fire Fighting/ safety Precaution and First Aids d) Traffic Control System, e) Nonconventional Energy source. f) Problems of drinking water in rural areas g) above or any other suitable topic	
03	**Group Discussion** The student should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are- a) Sports b) Current news items c) Discipline & House Keeping d) Unemployment f) Illiteracy g) Dowry Problem h) Duties and responsibilities of students e) Futures in Indian Economy f) Indian Mission to Mars g) Any other suitable topic	8

04	**Free & Open Source Software** (a) Introduction to FOSS (b) Installation of Libra Office (c) Getting started with Libra office Writer Typing text and basic formatting in Writer Inserting Picture & Objects in Writer document Viewing & Printing a Text document (d) Using Different Tools in Writer Using search replace auto correct Typing in local languages Using track changes Header Footer and notes Creating newsletter	8

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

List of the members for the branch of Diploma in Instrumentation and Control Engineering are:

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