

Scheme of Teaching and Examination for IV Semester
DIPLOMA in INSTRUMENTATION AND CONTROL ENGG.

THEORY

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME					
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Terminal Exam. (A) Marks	Final Exam. (B) Marks	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
1.	Electrical Machine & Control	40401	6	50	3	20	80	100	26	36
2.	Electronics Comp. & Materials	21402	6	50	3	20	80	100	26	36
3.	Advance Electronic Devices & Circuits.	21403	6	60	3	20	80	100	26	36
4.	Network and Lines	21404	6	50	3	20	80	100	26	36
5.	Instrumentation & Process Control	40405	6	50	3	20	80	100	26	36
Total :-			30		Total			500		

PRACTICAL

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION – SCHEME					
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Marks Internal Exam. (A)	Marks External Exam. (B)	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
1.	Electronics Construction And repair Lab	21406	6	60	3	20	80	100	32	42
Total :-			6					100		

SESSIONAL

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME			
			Periods per Week	Periods in One Session (Year)	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject
1.	Electronics Circuit Lab	21407	3	50	40	60	100	50
2.	Digital Electronics Lab	21408	3	50	20	30	50	25
Total :-			6					150

Total Periods per Week	42	Total Marks	750
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ELECTRICAL MACHINE AND CONTROL

Subject Code 40401	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	05	-	-	Internal Exam.	:	20

RATIONALE:-

The students are well conversant with the electric and magnetic field and circuit, electro-magnetic induction, D.C. and A.C. circuits, based on related electric and magnetic theories. They also know about electrical components and materials, Now the Electrical Machine is being introduced for IVth Semester Diploma in Electrical & Electronics Engineering to impart the knowledge of D.C. & A.C. machines, which play vital roles even in this era of electronics in different industries throughout the world.

The topics of requisites and construction of D.C. machines, generators, D.C. & A.C. motors, converters, special motors and electro plating have been included in the content. Which will give full insight of electrical equipments in their practical life.

Topics have been divided into sub-topics in order to facilitate the students to understand the subject matters properly. Tentative no. of lectures have been allotted for each topic and sub-topic, so that the whole syllabus may be covered easily in the academic year.

OBJECTIVES :-

The thorough study of these topics will enable the students know fully about D.C. machines, their operation, maintenance and proper connection and hence will enable him to work as a good supervisor and also to efficiently monitor the works of operators under him. The topics of special motors used and that of electroplating will provide full insight of practical use of electrical equipments.

CURRICULUM :-

Sl.No.	Topics	Periods
1.	Requisites and Construction of D.C. Machines.	15
2.	D.C. Generator	15
3.	D.C. Motor	15
4.	A.C. Motor	05
Total-		[50]

CONTENTS :-

TOPIC : CONTENT :

01.	<u>Requisites and Construction of D.C. Machines</u>	[15]
01.01	Armature winding: Pole-pitch, Conductor coil and winding elements, coil span, coil-pitch, pitch of winding, back pitch, front pitch, resultant pitch, commutator pitch.	
01.02	Single layer winding, lap and wave winding, use of lap and wave windings.	
02.	<u>D.C. Generator</u>	[15]
02.01	Types of generator, E.M.F. equation of generator.	
02.02	Losses and efficiency of a generator, condition for maximum efficiency.	
02.03	Generator characteristics: No load curve of self-excited generator, How to find critical resistance, How to draw O.C.C. at different speeds, critical speed, voltage build-up of a shunt generator, condition for voltage build-up.	

03. D.C. Motor [15]

- 03.01 Significance of back E.M.F. voltage equation of a motor, armature torque, shaft torque.
- 03.02 Characteristics of series shunt and compound motors.
- 03.03 Losses and efficiencies of a motor.
- 03.04 Speed control of a D.C. motor: Speed control of a series motor, speed control of a shunt motor, merits and demerits of a rheostatic control method, series. Parallel control.
Simple problems.
- 03.05 Testing of D.C. Motors : NO-load test (Swin Burne's test) of D.C. shunt motor, back to back test (Hopkinson's test), retardation test of a series motor.
- 03.06 Necessity of a starter : Shunt motor starter: 3-point starter, 4-point starter.

04. A.C Motor [05]

- 04.01 Speed control of induction motors : control from startor side, control from rotor side.
- 04.02 Direct On-Line starter, star-Delta starter and Autotransformer starter.

Recommended Books:-

Sl.No	Title/Publisher	Author
1.	Theory of Direct Current Machinery, TMN editions	Alexander S.Langsdorf
2.	A text-Book of Electrical Technology, Vol-II	B.L. Theraja
3.	Electrical Machinery, Khanna Publications	P.S. Pimbhra

ELECTRONIC COMPONENTS AND MATERIALS

Subject Code 21402	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

This subject is being introduced in the Electronics/Electronics and Tele-communication diploma technical programme to prepare a strong base for the students to understand the subjects of electronics that they will have to come across in their higher stage of learning.

The topics and sub-topics are being included which will help the students to:

- Know the characteristics of different electronic components and materials.
- Understand their principles, characteristics, functions and use.
- Develop skill to apply the knowledge in proper selection and use of the electronic components and materials.
- Able to distinguish different types of resistors, capacitors etc. through their color codes.
- Understand the principle of soldering.

CURRICULUM

Sl.No.	Topics	Periods
1.	Resistor	11
2.	Capacitors	09
3.	Transformer and Chokes	05
4.	Induction Coils	06
5.	P.C.B. Construction materials	13
6.	Electronic packaging parts	06
Total-		50

CONTENTS

Topics

01	<u>Resistor</u>	11
01.01	Characteristics	02
01.02	Classification: Fixed resistors, Metal film, Carbon film, Wire wound, Variable resistors, Rheostat, Chip resistors, Thermistors, and Varistors.	08
01.03	Color coding (with simple problem)	01
02	<u>Capacitors</u>	09
02.01	General description and characteristics.	02
02.02	Classification: Fixed capacitors, Mica capacitors, Paper capacitors, Plastic film capacitors, Ceramic glass capacitors, and Electrolytic capacitors.	06
02.03	Color Coding.	01
03	<u>Transformer and Chokes</u>	05
03.01	Applications and general principles of operation.	01
03.02	Types of magnetic circuits.	02
03.03	Materials for cores and manufacturing of stacked cores.	02

04	<u>Induction Coils</u>	06
04.01	Classification and characteristics. Types of Core.	02
04.02	G of a Coil.	01
04.03	Methods used to decrease Skin Effect.	01
04.04	Eddy Current Loss.	01
04.05	Dielectric loss and distributed capacitances in coils.	01
05	<u>P.C.B. Construction Materials</u>	13
05.01	Base Materials.	05
05.02	Metal Foil.	03
05.03	Types of Boards.	02
05.04	Methods of Fabrications. Taping materials	03
6.	<u>Electronic packaging parts</u>	06

Recommended Books

Sl.No.	Title/Publisher	Author
1.	Radio Circuit Construction, Mir Publication.	A.T. Belesvtsev
2.	Hand Book for Electronic Engineering Technician	Milt Mafman and Arthur H. Seedman
3.	Electronic Assembly and Fabrication	Goshan J. Wheeler

ADVANCE ELECTRONIC DEVICES AND CIRCUITS

Subject Code 21403	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

RATIONALE:-

This paper is meant to make the students familiar with widely used IC chips and the solid state devices such as FETS.

The utility of Electronic Devices depends on circuits. Students are to study amplifier and oscillator circuits of different type meant for various applications and specific uses.

The topics to be covered are:

CURRICULUM

Sl.No. Topics	Periods
1. Transistor Biasing.	07
2. Transistor as Amplifier	07
3. Coupled Amplifiers.	09
4. Feed-Back Amplifiers.	10
5. Oscillators.	10
6. FET Amplifiers.	09
7. Operational Amplifier.	08
Total-	50

CONTENTS

Sl.No. Topics	Periods
01. <u>Transistor Biasing</u>	07
01.01 Output Characteristics of CE Amplifier.	
01.02 Operating Point.	
01.03 Bias Stability.	
01.04 Types of Biasing.	
01.05 Bias Compensation.	
01.06 Thermal Sunway.	
02. <u>Transistor as Amplifier</u>	07
02.01 Hybrid Circuits.	
02.02 Z, Y & H Parameters of Two Port Networks.	
02.03 Equivalent Circuit of Transistor at low and medium frequencies.	
02.04 Analysis of voltage gains, current gain, power gain, input impedance and output impedance.	
03. <u>Coupled Amplifiers</u>	09
03.01 Cascading of Amplifier Types.	
03.02 Principles of R-C, D-D and Transformer Coupling.	
03.03 Gain Bandwidth consideration.	
03.04 Effects of coupling on amplifier performance.	
03.05 Changes in frequency response and due to effects on coupling.	
03.06 High frequency considerations.	
03.07 Compensation of amplifier for high and low frequency tuned circuit.	

04.	<u>Feed-Back Amplifiers</u>	10
04.01	Classification concept.	
04.02	Gain with feedback, input resistance, type of resistance.	
04.03	Current Series and Current Shunt Feedback Circuits.	
04.04	Voltage Series and Voltage Shunt Feedback Circuits.	
04.05	Voltage Shunt Feedback Circuits with Frequency Response.	
05.	<u>Oscillators</u>	10
05.01	Principle of Oscillators.	
05.02	Effect of feedback on Amplifier Bandwidth.	
05.03	Gain and Phase Margin.	
05.04	Wein Bridge Oscillator (Basic idea).	
05.05	Crystal Oscillator.	
05.06	Frequency Stability.	
06.	<u>FET Amplifiers</u>	09
06.01	Biasing of FETs.	
06.02	CS, CD, CG amplifiers with equivalent circuits analysis and frequency response.	
06.03	Biasing of UJT.	
07.	<u>Operational Amplifiers</u>	08
07.01	Basic Operational Amplifier (OP-AMP).	
07.02	Differential Amplifier.	
07.03	Operational Amplifier Parameters.	
07.04	Parameters Measurement.	
07.05	Basic Circuits: Subtractor, Adder, Integrator, Differentiator circuits using Operational Amplifier (OP-AMP).	

Reference Books:-

Sl.No.	Title/Publisher	Author
1.	Integrated Electronics	Millman and Halkias
2.	Electronics Devices and Circuits	John D. Ryder
3.	Electronics Devices and Circuits	Millman and Halkias
4.	Linear Integrated Circuits	Byan
5.	Principle of electronics	V.K Mehta
6.	Basic electronics	B.L. Thereja

NETWORK AND LINES

Subject Code 21404	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

RATIONALE:-

Objectives

The topics to be covered are:

CURRICULUM

Sl.No. Topics	Periods
1. Network Parameters	07
2. Two Port Network	12
3. Attenuator and Equalizers	04
4. Filters	08
5. Transmission Lines	19
Total-	50

PART I - GENERATION

Topics Content	Periods
01. <u>Network Parameters</u>	07
01.01 Active and Passive Elements.	02
01.02 Linear and non-linear elements.	01
01.03 Unilateral and Bilateral Elements.	01
01.04 Lumped and Distributed Elements.	01
01.05 Ideal and Practical Voltage and Current Sources.	01
01.06 Concept of Nodes, Mesh, Branch, Loop etc.	01
02. <u>Two Port Network</u>	12
02.01 Introduction to Z, Y and ABCD parameters.	01
02.02 Equivalent Circuits in Z, Y, ABCD, h parameters.	02
02.03 Transfer function, Concept and Calculation for two port network.	01
02.04 Four Terminal Networks.	01
02.05 Symmetrical and Asymmetrical Networks.	01
02.06 Image and Iterative Impedance.	01
02.07 Design of Simple Symmetrical and Asymmetrical networks.	01
02.08 Propagation Constant.	01
02.09 T and Pai Network.	01
02.10 T to Pai to T network transformation.	01
02.11 Ladder and Lattice Network.	01
03. <u>Attenuator and Equalizers</u>	04
03.01 Symmetrical and Asymmetrical Networks.	01
03.02 Design of T and Pai type attenuators.	01
03.03 Equalizers - Introduction.	02

04.	<u>Filters</u>	08
04.01	Concept of Decibel and Neper.	01
04.02	Basic Relations in Filters.	01
04.03	Classification as per use: Low Pass Filters, High Pass Filters, Band Pass Filters and Band Stop Filters.	02
04.04	Attenuation and phase shift characteristics.	02
04.05	Design of simple T and Pai type in derived filters.	02
05.	<u>Transmission Lines</u>	19
05.01	Classification.	01
05.02	Introduction to open wire, co-axial cable, wave guide, optical fibers with application.	01
05.03	Distributed parameters of lines.	01
05.04	Equivalent Circuit of a finite line.	01
05.05	T and Pai type representation of a section of line.	01
05.06	Voltage and Current distribution in an infinite line.	01
05.07	Characteristics impedance a TX line.	01
05.08	Concept of propagation, attenuation constant and phase shift constant of a line.	01
05.09	Expression for impedance at a point on line.	01
05.10	Reflected and standing waves.	02
05.11	Voltage reflection coefficient and VSWR.	01
05.12	Maximum and Minimum impedance.	02
05.13	Input and Output impedance of an open and short-circuited loss-less line.	01
05.14	Input impedance as a function of length of line.	01
05.15	Introduction to Smith Chart and Circle Diagrams.	03

Recommended Books:-

Sl.No.	Title/Publisher	Author
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INSTRUMENTATION AND PROCESS CONTROL

Subject Code 40405	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks		
	L	T	P/S	Annual Exam.	:	100
	06	-	-	Internal Exam.	:	80
					20	

Rationale and objectives :-

The instrument part deals with the principles and functioning of measuring instruments. Instrumentation is the use of measuring instruments to monitor and control of process variables within a laboratory, production or manufacturing area. While sensors and values are important in all aspects of engineering they assume greatest importance in the study of automatic control which is termed process control when applied in process industries.

Sl.No.	TOPIC	PERIODS
1.	Measurement and measuring systems	4
2.	Characteristics of instruments and measuring systems	4
3.	Errors in measurement.	3
4.	Analog Ammeter and voltmeters	6
5.	Extension of Instrument Range	4
6.	Measurement of Power and Energy	6
7.	Measurement of Resistance, Inductance and Capacitance	8
8.	Basics of Process control	5
9.	Pneumatic Control elements	5
10.	Hydraulic Control element.	5
Total-		50 periods

TOPICS:-

1. Measurement and Measuring systems :-

- 1.1 Introduction
- 1.2 Measurement systems
- 1.3 Methods of measurement
- 1.4 Classification of Instruments
- 1.5 Functions of Instrument and measuring system
- 1.6 Instrument Automation
- 1.7 Applications of measurement Instrumentation

TOPICS:-

2. Characteristics of Instruments and measuring systems :-

- 2.1 Introduction
- 2.2 Static characteristics
- 2.3 Loading effects

TOPICS:-

3. Errors in Measurement :-

- 3.1 Absolute error
- 3.2 Relative error and percentage error
- 3.3 Resolution and sensitivity
- 3.4 Accuracy and Precision
- 3.5 Types of errors

TOPICS:-

4. Analog Ammeters and Voltmeters :-

- 4.1 Introduction
- 4.2 Moving Iron and moving Coil instruments
- 4.3 Dynamometer Type Instruments
- 4.4 Induction Type instruments

TOPICS:-

5. Extension of Instrument Range :-

- 5.1 Ammeter shunts
- 5.2 Multipliers for Electrostatic Voltmeters
- 5.3 Current Transformers
- 5.4 Potential Transformers

BOOKS :-

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|---|--|
| 1. Electrical & Electronics Measurements | - A.K.Stwney- Dhanpat rai & Co. |
| 2. A course in Electronic and Electrical Measurements and instrumentation | - J.B.Gupta- S.K.Kataria & sons. |
| 3. Advance instrumentation & control | M.F.Kureshi. |
| 4. Process control by Harrist | P – Mc Graw Hill. |
| 5. Automatic process control | - Eckman D.P, Willey Eastern. |
| 6. Automatic process control systems Concepts and Hardware | - Ronald P Hunta P.E., P.H.I, New Delhi. |

TOPICS:-

6. Measurement of Power and Energy:-

- 6.1 Introduction
- 6.2 Dynamometer type wattmeter
- 6.3 Induction type wattmeter
- 6.4 Measurement of energy

TOPICS:-

7. Measurement of Resistance, Inductance and capacitance:-

- 7.1 Introduction
- 7.2 Measurement of low, medium and high resistance
- 7.3 Measurement of Inductance : Maxwell, Anderson, Hay and Owen bridges
- 7.4 Measurement of Capacitance by scherring bridge

TOPICS:-

8. Basics of Process control:-

- 8.1 Basic concepts of Process control
- 8.2 Open loop and closed loop control
- 8.3 Process Variables
- 8.4 Types of control and their applications.
- 8.5 Process lag, measurement lag, dead time
- 8.6 Concept of on-off, **Proportional**, Integral and **derivative** control.

TOPICS:-

9. Pneumatic Control elements:-

- 9.1 Pneumatic pressure supply
- 9.2 Pneumatic actuators, relays, pressure **switches** contractors, etc.

TOPICS:-

10. Hydraulic control element:-

- 10.1 Introduction
- 10.2 Hydraulic actuators
- 10.3 Hydraulic valves

ELECTRONIC CONSTRUCTION AND REPAIR LAB.

Subject Code 21406	Practical			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	-	-	06	Internal Exam.	:	20

LIST OF PRACTICALS:-

Sl.No. Content

1. Construction of a Battery Eliminator Box, Stabilizer Box, Radio and TV Cabinets.
2. Soldering Practice: connecting circuit components.
3. Assembling Battery-Stabilizer, Radio Receiver, Intercoil Circuit.
4. Assembling Inverter.
5. – Location of faults and repair of:-
 - Battery Eliminator
 - Voltage Stabilizer
 - Inverter
 - Radio Receiver
6. Location of faults in different types of Electronics Circuits.
7. Tracing fault in a C.H.O. and its repair.
8. Handling of different types of multimeter: VTVM, Frequency meters, Calculators.
9. Fault Location and repair of instruments - Multimeter VTVM, Frequency meters, Calculators.
10. Repair of faulty study panels of your laboratory.

Note: Three assignments for practical under SL 1 and 2. Two assignments for practical listed under SL 3 and 4, and at least one assignment for each of the practical under SL No. 5 to 10. Altogether eleven assignments to be done by the students in the workshop or laboratory.

ELECTRONICS CIRCUIT Lab.

Subject Code 21407	Sessional			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	60
	-	-	03	Internal Exam.	:	40

LIST OF SESSIONALS:-

SL Experiments

1. Introduction to various meters and instruments to be used.
– Study of CRO; Phase and Frequency measurement.
2. Measurement of h-parameter of transistor.
3. Frequency response of a CE amplifier.
4. Frequency response of direct-coupled amplifier.
5. Frequency response of RC-coupled amplifiers.
6. Characteristics of a transformer-coupled amplifier.
7. Calculation of gain, input impedance and output impedance in case of cascaded amplifiers.
8. Operation of Push-Pull amplifier.
9. Operation of Class C amplifier.
10. Characteristics Curves of FETs.
11. Operation of Wein Bridge and RC Phase shift oscillator.
12. Verification of basic operation of OP-AMP curves.
13. Use of OP-AMP as Adder and Subtractor.
14. Use of OP-AMP as integrator and differentiator.

DIGITAL ELECTRONICS Lab.

Subject Code 21408	Sessional			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	60
	-	-	03	Internal Exam.	:	40

LIST OF SESSIONALS:-

Sl.No. Experiments

1. Construction and verification of diode OR gate.
2. Construction and verification of diode AND gate.
3. Verification of truth table of Basic Gates.
4. Verification of truth table of Universal Gates from ICs.
5. Construction of Basic gates from Universal Gates.
6. Construction of Ex-OR gate from Universal Gates.
7. Construction of Half Adder and Full adder circuit from Gates and Verification of its function.
8. Construction of Half and Full subtractor circuit from Universal Gates and Verification of its function.
9. Verification of truth table of R-S and J-K Flip Flop.
10. Operation of Transistor Multimeter circuits.
11. Operation of multivibrator functions from 555 IC.
12. Construction and verification of function of Ripple and BCD Counter.
13. Construction and verification of Sequence Generator.