TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **II Year ELECTRONICS ENGINEERING**
SESSION – 2009-2010 & ONWARDS
Third Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
*EL 31	Electronic Components and shop Practice	2	--	4	6	70	3	50	3	30	--	50	200
*EL 32	Electrical Engg. and Measurement	3	--	2	5	70	3	--	--	30	--	50	150
*EL 33	Network Analysis	3	2	--	5	70	3	--	--	30	50	--	150
*EL 34	Electronic Devices and Circuits	3	--	2	5	70	3	50	3	30	--	50	200
*EL 35	Digital Electronics	3	--	2	5	70	3	50	3	30	--	50	200
*EL 36	Basic Communication Engineering	3	--	2	5	70	3	--	--	30	--	50	150
*EL 37	Electronic Instruments	3	--	2	5	70	3	50	3	30	--	50	200
	Total	20	2	14	36	490		200		210	50	300	1250
												Grand Total:	**1250**

1. L:Lecture
2.T:Tutorial
3.P:Practical
4.TH:Marks for University Examination for Theory
5.PR: Marks for University's Examination for Practicals
6.CT:Marks for Class Tests
7TU:Marks for Tutorials
8.PR(S):Marks for Practical and Viva

*EL 31 Same as EF 31/IE 31 *EL 32 Same as EF 32/IE 32 *EL 33 Same as EF 33/IE 33
*EL 34 Same as CS 34/EF 34/IE 34 *EL 35 Same as CS 35/EF 35/IE 35 *EL 36 Same as CS 36/EF 36
*EL 37 Same as EF 37

TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **II Year ELECTRONICS ENGINEERING**
SESSION – 2009-2010 & ONWARDS
Fourth Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
*EL 41	Electronics Workshop	2	--	4	6	70	3	50	3	30	--	50	200
*EL 42	Electronic Circuits	3	--	2	5	70	3	50	3	30	--	50	200
*EL 43	Pulse & Wave Shaping Circuits	3	--	2	5	70	3	50	3	30	--	50	200
*EL 44	Digital Instruments	3	--	2	5	70	3	--	--	30	--	50	150
*EL 45	Instrumentation and Control System	3	--	2	5	70	3	--	--	30	--	50	150
*EL 46	Transmission Lines and Wave Propagation	3	2	--	5	70	3	--	--	30	50	--	150
*EL 47	Microprocessor	3	--	2	5	70	3	50	3	30	--	50	200
	Total	20	2	14	36	490		200		210	50	300	1250
												Grand Total:	**1250**

1. L:Lecture
2.T:Tutorial
3.P:Practical
4.TH:Marks for University Examination for Theory
5.PR: Marks for University's Examination for Practicals
6.CT:Marks for Class Tests
7TU:Marks for Tutorials
8.PR(S):Marks for Practical and Viva

*EL 41 Same as EF 41
*EL 42 Same as EF 42
*EL 43 Same as EF 43
*EL 44 Same as EF 44
*EL 45 Same as EF 45
*EL 46 Same as EF 46
*EL 47 Same as EF 47

TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **III Year ELECTRONICS ENGINEERING**
SESSION – 2009-2010 & ONWARDS
Fifth Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
EL 51	Audio and Video System	3	--	3	6	70	3	--	--	30	--	50	150
*EL 52	Power and Industrial Electronics	3	--	3	6	70	3	50	3	30	--	50	200
*EL 53	Computer Architecture and Organisation	3	2	--	5	70	3	--	--	30	50	--	150
EL 54	Communication System	3	--	2	5	70	3	--	--	30	--	50	150
*EL 55	Linear Integrated Electronic Circuits	3	--	3	6	70	3	50	3	30	--	50	200
EL 56	**Elective – I**												
	EL 561 Microwave Engineering	3	2/2	--	4	70	3	--	--	30	50	--	
	EL 562 Tele Communication Switching Networks	3	2/2	--	4	70	3	--	--	30	50	--	150
EL 57	**Elective – II**												
	*EL 571 'C' Programming	2	--	2	4	70	3	--	--	30	--	50	
	*EL 572 Computer in Business Systems	2	--	2	4	70	3	--	--	30	--	50	150
	Practical Training (24 Working Days)							100					100
											Grand Total:		**1250**

*EL 52 Same as EF 52/IE 52
*EL 53 Same as EF 53/IE 53
*EL 55 Same as EF 55
*EL 571 Common for All Branches of Engineering except CS & IT
*EL 572 Common for All Branches of Engineering

TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **III Year ELECTRONICS ENGINEERING**
SESSION – 2009-2010 & ONWARDS
Sixth Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
EL 61	Television Engineering	3	--	2	5	70	3	50	3	30	--	50	200
EL 62	Advance Microprocessor	3	--	3	6	70	3	50	3	30	--	50	200
*EL 63	Biomedical Instrumentation	3	--	2	5	70	3	--	--	30	--	50	150
EL 64	Advance Communication System	3	--	3	6	70	3	--	--	30	--	50	150
*EL 65	Electronic Circuit Design	3	--	3	6	70	3	50	3	30	--	50	200
EL 66	**Elective – III**												
	EL 661 Radar and Navigation	3	2/2	--	4	70	3	--	--	30	50	--	
	EL 662 Computer Communication	3	2/2	--	4	70	3	--	--	30	50	--	150
EL 67	**Elective – IV**												
	*EL 671 Management	2	2	--	4	70	3	--	--	30	50	--	
	*EL 672 Entrepreneurship Development	2	2	--	4	70	3	--	--	30	50	--	
	*EL 673 Production System Management	2	2	--	4	70	3	--	--	30	50	--	150
	Project (24 Working Days)							100					100
												Grand Total:	**1300**

*EL 63 Same as IE 63
*EL 65 Same as EF 65
*EL 671/EL 672/ EL 673 Common for All Branches of Engineering

ELECTRONIC COMPONENTS AND SHOP PRACTICE

	L	T	P
CODE EL 31			
EB 31/EF 31/ IE 31	2	--	4

RATIONALE

Every electronic circuit uses electronic components, it is therefore essential to know about the construction, working and identification of different components, hardwares and transducers to enable the students to assemble any project. Soldering techniques and operation of different general instruments also included in this subject.

CONTENTS

1. Resistors :

1.1 Classification of resistors
1.2 Colour coding , tolerance and various parameters related with resistor
1.3 Constructional details, specifications, applications of various types of resistors

1.3.1 Fixed - carbon composition, metal film, carbon film, wire wound, alloy
1.3.2 Semi-variable - carbon (vertical and horizontal type) presets cermet, multiturn trimpot
1.3.3 Variable - carbon and wire wound (log and linear) with and without switch, multi turn pot and ganged pot,
1.3.4 Special resistors - LDR, VDR, Thermistor, Sensistors, Fusible resistors.

1.4 Failures in resistors

2. Capacitors :

2.1 Classification of capacitors
2.2 Constructional detail, specification, application of various types of capacitors-

2.2.1 Fixed capacitor - mica, paper, ceramic, plastic film and electrolytic
2.2.2 Variable capacitor - Gang (Air and PVC). Trimmer and padder

2.3 Failures in capacitor
2.4 Identification marking on capacitor (colour coding)

3. Inductors :

3.1 Classification of inductor
3.2 Construction detail, specification, application of fixed and variable inductors - Aircore, Iron core and Ferrite core inductors

4. Electronic Hardwares:

4.1 Construction, working, specification and application of electronic hardwares such as

4.1.1 Switches - Slide, toggle, push button type
4.1.2 Band switches - Rotary wafer type , slide type, push button type
4.1.3 Relay - construction, symbol, contacts
4.1.4 Connectors - Rack and panel, printed circuit, co-axial, tape cable, and plate connectors
4.1.5 Miscellaneous - Crocodile clips, indicator (mains), jacks, plugs, socket, heatsinks and component preformer

4.2 Loud speaker (PM type), Tweeter and woofer

4.3 Microphone - Carbon type, electrodynamic type, condenser and crystal microphone
4.4 Construction of soldering iron, soldering station and desoldering station
4.5 Different tools used in electronic workshop such as:- Nose plier, Cutter, Wire stripper, Tweezer, Screw driver etc.,

5. Soldering and De-Soldering Techniques :

5.1 Soldering - connection, flux alloy, different soldering materials and problems
5.2 Different soldering methods - hand, wave, dip and ultrasonic
5.3 De-soldering technique

PRACTICALS

1. Identification of different type of resistors and study of their colour coding
2. Identification of different type of capacitors and study of their colour coding
3. Identification of different type of switches and their mechanism of operation
4. Study of different tools used in electronics workshop
5. Use and application of component preformer
6. Study of analog and digital multimeters and their uses for measuring voltage, current and resistance
7. Testing of electronic components. Such as: Switches, resistors, capacitors, inductors, diode and transistors
8. To study and read the component data manual
9. Identification of different type of connectors
10. Use of CRO for various measurements
11. Use of function generator for different waveform generation.
12. Study of relay and contacts.
13. Soldering and de-soldering of different components on PCB by soldering iron
14. Preparation of sketches of different electrical and electronic component as per international standards on drawing sheets

REFERENCE BOOKS :

1. Electronics Component & Shop Practice K.R. Nahar
2. Hand Book of Philips Component
3. Maintenance of Electronic Equipments K.S. Jamwal
4. Electronic Shop Practice. Madhavia Joshi.
5. Electrical & Electronic Materials M.L.Gupta

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ELECTRICAL ENGINEERING AND MEASUREMENT

	L	T	P
CODE EL 32			
EF 32/ IE 32	3	--	2

RATIONALE

This course aims to familiarise the students about the basic principles of electrical engineering, electrical machines and most generally used instrument for measurement of electrical quantity in industry. This curriculum helps them to operate the machines and different measuring instruments.

CONTENTS

1. D.C. Machine :

- 1.1 Principle of D.C. motor
- 1.2 Construction of D.C. motor
- 1.3 Back e.m.f., speed, torque and power relationship
- 1.4 Characteristics of D.C. motor
- 1.5 Type and application of D.C. motor
- 1.6 Simple idea of motor starter

2. A.C. Machine :

- 2.1 Brief construction and working of single phase induction motor
- 2.2 Brief construction and working of synchronous motor
- 2.3 Construction and working of stepper motor

3. Polyphase Circuit :

- 3.1 Star delta connection
- 3.2 Current, voltage and power relation for star delta connection
- 3.3 Advantage and disadvantage of polyphase circuit
- 3.4 Simple problem on star delta circuit

4. A.C. Bridges :

- 4.1 Generalized treatment of four arm A.C. bridges
- 4.2 Sources and detectors
- 4.3 Maxwell's inductance and capacitance bridges
- 4.4 Hay's bridge
- 4.5 Anderson bridge
- 4.6 Heaviside bridge
- 4.7 Schersing bridge
- 4.8 De-sauty's bridge and Wein's bridge

5. Measuring Instruments :

- 5.1 Classification of measuring instruments
- 5.2 General consideration of torques employed in indicating type instrument (deflection torque, control torque, damping torque)
- 5.3 Construction and working of voltmeter and ammeter
  - 5.3.1 Moving iron type
  - 5.3.2 Moving coil type
  - 5.3.3 Rectifier type
  - 5.3.4 Dynamometer type
- 5.4 Construction and working of wattmeter
  - 5.4.1 Dynamometer type
  - 5.4.2 Induction type
- 5.5 Induction type energy meter

5.6 Ohmmeter

5.6.1 Series type
5.6.2 Shunt type

6. Range Extension and Calibration :

6.1 Significance of range extension
6.2 Use of series and shunt multipliers
6.3 Instrument transformer for range extension
6.4 Working principle of potentionmeter
6.5 Calibration method of ammeter and voltmeter (D.C.) by potentiometer
6.6 Multirange ammeter and voltmeter
6.7 Simple problems
6.8 Vector impedance meter
6.9 Magger
6.10 Cable fault locator

PRACTICALS

1. Study of D.C. motor parts
2. Study the load characteristics of D.C. shunt and series motor
3. Study of induction motor
4. Study of synchronous motor
5. Study of stepper motor
6. Study of construction of moving coil, moving iron type instruments
7. Study of Maxwell's impedance, capacitive bridge.
8. Study of Hay's bridge
9. Study of Schering's bridge
10. Study of De-sauty's bridge and Wein bridge
11. Use of series multiplier for voltmeter range extension
12. Use of shunt multiplier for ammeter range extension
13. Calibration of voltmeter and ammeter (D.C.) using potentiomeor
14. Measurement of insulation resistance by megger
15. Study of induction type energy meter

REFERENCE BOOKS :

1. A Course in Elect. Engg. — K.D. Sharma
2. Electrical Technology — S.L. Uppal
3. Electrical Technology — J.B. Gupta
4. A Course in Electrical & Electronics Measurements & Measuring Instruments — A.K. Sawhrey
5. Electrical Machine — I.J. Nagpal
6. Electrical Technology — B.L. Thareja

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NETWORK ANALYSIS

	L	T	P
CODE EL 33			
EF 33/ IE 33	3	2	--

RATIONALE

Analysis of any electronics circuit is essential for any electronics engineer. To analyse any circuit the knowledge of network elements and their behaviour, different types of networks and networks configuration is essential. Different network theorem and laws guide the proper way to analyse the networks. Laplace transformation helps an engineer to reduce the mathematical calculations.

CONTENTS

1. General Network Concept :

1.1 Network Elements (Definition and examples)

1.1.1 Active and passive, Linear and non-linear, Unilateral and bilateral, Lumped and distributed circuit parameters

1.2 Initial conditions in elements
1.3 Mutual inductance (coupling coefficient and dot rule)
1.4 Voltage and current sources (ideal and practical)
1.5 Dependent and independent sources
1.6 Accompanied and unaccompanied sources
1.7 Classification of networks (Definition and examples)

1.7.1 One port network
1.7.2 Two port network

1.8 Network configuration (No formula derivation)

1.8.1 Balanced and unbalanced T section
1.8.2 Symmetrical and Asymmetrical π (Pie) section
1.8.3 L section
1.8.4 Lattice section
1.8.5 Bridge
1.8.6 Bridge T section
1.8.7 ladder network

2. Mesh and Nodal Analysis :

2.1 Definition of branch, node, mesh, loop and tree.
2.2 Kirchhoff's laws
2.3 Voltage and current equations for simple meshes and nodes
2.4 Cramer's Rule
2.5 Simple problems upto three variable using Cramer's rules (for DC circuits only)

3. Laplace Transformation :

3.1 Introduction to Laplace transformation
3.2 Solution of first order and second order differential equations (no initial condition)
3.3 Laplace transform of -

3.3.1 Unit step function
3.3.2 Ramp function
3.3.3 Exponential function
3.3.4 Impulse function
3.3.5 Sinusoidal functions
3.3.6 Parabolic function
3.3.7 Derivative of function
3.3.8 Integral of function

3.4 Laplace transform theorems

3.4.1 Shifting theorem
3.4.2 Initial and final value theorem

3.5 Inverse Laplace transformation for simple, multiple and conjugate complex roots.
3.6 Application of Laplace transformation for simple RL, RC and RLC series circuits
3.7 D.C. transients in RL, RC and RLC circuits

3.7.1 Determination of initial condition
3.7.2 Determination of final condition
3.7.3 Simple numerical problems

4. Network Theorems :

4.1 Statement, proof, application and numerical problems (DC circuit only) related to
4.1.1 Superposition theorem
4.1.2 Reciprocity theorem
4.1.3 Thevenin's theorem
4.1.4 Norton's theorem
4.1.5 Millman's theorem
4.1.6 Maximum power transfer theorem
4.1.7 Tellegen's theorem (Only statements)
4.1.8 Star Delta conversion

5. Two Port Networks :

5.1 Introduction
5.2 Open circuit impedance parameters
5.3 Short circuit admittance parameters
5.4 Hybrid (h) parameters
5.5 Transmission parameters
5.6 Inter-relationship between Z and Y parameters
5.7 Equivalent models of Z and Y parameters
5.8 Reciprocity and symmetry of two port networks
5.9 Equivalent T and π (Pie) section representation
5.10 Determination of Z and Y parameters for some special networks (T, π, lattice, bridge T)
5.11 Idea of image impedance, characteristics impedance for two port networks

6. Resonance :

6.1 Series resonance in uncoupled circuits

6.1.1 Definition, reactance curves, resonance condition, selectivity and bandwidth

6.2 Parallel resonance in uncoupled circuits

6.2.1 Circuit and phasor diagram
6.2.2 Derivation of resonance conditions
6.2.3 Selectivity and bandwidth

6.3 Q factor, Q factor on energy basis

REFERENCE BOOKS :

1. Network Analysis — Arumugan & Prem Kumar
2. Network Analysis — Dhar & Gupta
3. Network Analysis — Ven Valenburg
4. A Course in Circuit Analysis — Soni & Gupta
5. A Course in Circuit Analysis — Umesh & Sinha

6.	Circuit Theory	Iyer
7.	Electric Circuits	Josheep Edminster
8.	Network Analysis	Suba Rao & Prasad
9.	Circuit Analysis	Hayt

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ELECTRONIC DEVICES AND CIRCUITS

	L	T	P
CODE EL 34			
CS 34/ EF 34/ IE 34	3	--	2

RATIONALE

Today is the day of electronics. This subject covers the basic concept of electronics for engineers, this subject is foundation of electronics which helps the student to study the other subject.

CONTENTS

1. Vacuum Tubes :

1.1 Types of emissions.
1.2 Brief idea of construction, characteristics, working and applications of

- 1.2.1 Diode Valve.
- 1.2.2 Triode Valve.
- 1.2.3 Tetrode Valve.
- 1.2.4 Pentode Valve.
- 1.2.5 Photo Tube.

2. Semiconductor and PN Junction :

2.1. Metal, non metals and semiconductors and their Energy Band Diagram.
2.2 Intrinsic and Extrinsic Semiconductors.
2.3 Effect of temperature on extrinsic semiconductor
2.4 Energy band diagram of extrinsic semiconductor
2.5 Fermi Level and fermi dirac distribution
2.6 Drift and diffusion current
2.7 Hall effect
2.8 P-N Junction Diode

- 2.8.1 Space charge region, Barrier potential and effect of temperature
- 2.8.2 Energy band diagram
- 2.8.3 Biasing of diode.
- 2.8.4 V-I characteristics
- 2.8.5 Static and dynamic resistance
- 2.8.6 Transition and diffusion capacitance
- 2.8.7 Zenner and Avalanche breakdown

2.9 Working, characteristics and application of

- 2.9.1 Tunnel diode
- 2.9.2 Zener diode
- 2.9.3 Varactor diode
- 2.9.4 Photo diode
- 2.9.5 Light emitting diode (LED)

2.10 Photo conductors
2.11 Cds photo conductive cells and photo voltaic cell.

3. Bipolar Junction Transistor (BJT) :

3.1 Constructional details of PNP and NPN transistors
3.2 Working of a transistor

- 3.2.1 Charge transport phenomenon
- 3.2.2 Transistor amplifying action
- 3.2.3 Relation between different currents in a transistor
- 3.2.4 Simple problems

3.3 Configuration of transistor (CB, CE and CC)
3.4 Behavior of BJT in Active, Cut off and Saturation regions

3.4.1 Transistor as a switch
3.4.2 Transistor as an amplifier

4. Transistor Biasing and Bias Stability :

4.1 D.C. and A.C. Load line.
4.2 Operating point and its stability
4.3 Factors affecting bias stability
4.4 Stability factors
4.5 Bias stabilization
4.6 Calculation of operating point and stability factor for

4.6.1 Fixed Bias Circuit.
4.6.2 Collector to base biasing.
4.6.3 Voltage Divider biasing (Self bias)

4.7 Bias Compensation techniques using

4.7.1 Diode.
4.7.2 Thermistor and Sensistor.

4.8 Thermal stability and Thermal runaway

5. Small Signal Transistor Amplifier :

5.1 CB, CE and CC amplifier and their low frequency small signal equivalent circuit using hybrid parameters.
5.2 Calculation of voltage gain, current gain, input impedance, output impedance and power gain for resistive loads. (Av, Ai, Zi, Zo, Avs, Ais, and Ap)
5.3 Analysis of emitter follower circuit
5.4 Approximate analysis of CE amplifier with and without R_E , Emitter follower circuits
5.5. Classification of amplifiers

6. Field Effect Transistor :

6.1 Construction, operation and characteristics of JFET , E and D MOSFET
6.2 Biasing of FET
6.3 Small signal model of JFET
6.4 Terminology used with JFET
6.5 Precaution for handling of MOSFETs

7. Rectifiers and Power Supplies :

7.1 Working of rectifiers

7.1.1 Half wave rectifier
7.1.2 Centre tape full wave rectifier
7.1.3 Bridge rectifier

7.2 Analysis of rectifiers (for all type)

7.2.1 Calculations for average and RMS values
7.2.2 PIV of diodes
7.2.3 Ripple factor
7.2.4 Regulation and efficiency

7.3 Calculation of ripplefactor and working of following filters:

7.3.1 Capacitance filter
7.3.2 Inductance filter

7.3.3 L-C and π (Pie) filters

7.4 Voltage Multipliers
7.5 Regulated power supply using zener diode

7.5.1 Simple problems on zener regulator.

PRACTICALS

1. To plot the V-I characteristics of P-N diode and LED.
2. To plot the V-I characteristics of zener diode and study of zener diode regulator circuit
3. To plot the V-I characteristics of PNP transistor in CB, CE and CC configuration
4. To plot the V-I characteristics of NPN transistor in CB, CE and CC configuration and calculate h-parameter for CE configuration.
5. Study of the different biasing circuits and observe the effect of component variation on operating point
6. Study of half wave and full wave rectifiers.
7. Study of bridge rectifier.
8. To study the filter circuits and measure the ripple factor.
9. To plot the V-I characteristics of JFET
10. To plot the V-I characteristics of MOSFET.
11. To study the voltage multipliers.
12. To Study Emitter follower circuits and measure its input and output impedances
13. To study the behavior of Cds photo conductive, photo voltaic cell and photo conductors

REFERENCE BOOKS :

1. Electronic Devices & Circuits — Millman & Halkias
2. Electronic Devices & Circuits — G.K. Mittal
3. Electronic Devices & Circuits — A.Mottershed
4. Functional Electronics — K.V. Ramanan
5. Electronic Devices & Circuits — Mathur, Kulshrestha & Chadda
6. Electronic Devices & Circuits — Sanjeev Gupta

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DIGITAL ELECTRONICS

CODE EL 35	L	T	P
CS 35/ EB35/ EF 35/ IE 35	3	--	2

RATIONALE

Basic digital electronics is the requirement of modern computer, microprocessor and digital communication systems. On account of reliability and accuracy digital electronic systems are replacing conventional analog systems. A diploma pass out having knowledge of digital system will be useful to the industries.

CONTENTS

1. Introduction :

1.1 Digital signal and its representation
1.2 Advantages of digital techniques

2. Number System :

2.1 Decimal, binary, octal and hexa-decimal number system
2.2 Conversion of a number from one system to another system
2.3 Binary addition, subtraction and multiplication
2.4 Representation of positive and negative numbers
2.5 1's complement and 2's complement
2.6 Subtraction using 2's complement
2.7 Parity bit
2.8 Binary codes (Gray, Excess -3, Hamming codes), ASCII code
2.9 Floating point number

3. Logic Gates :

3.1 Introduction
3.2 Symbol and truth table of NOT, AND, OR, NAND, NOR, EX-OR and EX-NOR gates
3.3 Universal gates
3.4 Positve, negative and tristate logic

4. Logic Families :

4.1 Classification of digital ICs.
4.2 Characteristics of digital ICs.
4.3 RTL/RCTL
4.4 DTL
4.5 TTL logic - Operation of TTL NAND gate, open collector and totem - pole output, characteristics of TTL, TTL subfamilies
4.6 Concept of ECL and I^2 L.
4.7 PMOS, NMOS and CMOS (NAND, NOR, NOT) Circuits.
4.8 Comparison of logic families
4.9 Interfacing TTL with CMOS family

5. Boolean Algebra :

5.1 Historical review - logical statements, logical constants and variables, truth table
5.2 Boolean operators
5.3 Postulates of Boolean algebra
5.4 Laws of Boolean algebra
5.5 Duality theorem
5.6 De' Morgan's theorem
5.7 Simplification of Boolean expressions
5.8 Verification of Boolean expressions using truth table

6. Minimization Techniques (K-Mapping) :

6.1 Representation of Boolean expression - min. and max. term SOP, POS
6.2 Conversion of truth tables in POS and SOP form
6.3 Karnaugh map upto 4 variables - implication of logic function with and without don't care conditions
6.4 Realization of logic diagrams using NAND/NAND, NOR/NOR gate

7. Combinational Logic Design :

7.1 Binary half and full adder
7.2 Binary half and full subtractor
7.3 Binary serial, parallel and BCD adder
7.4 Parity bit generator and checker
7.5 Binary comparator
7.6 Multiplexer
- 7.6.1 4 to 1 multiplexer
- 7.6.2 16 to 1 multiplexer

7.7 Demultiplexer
- 7.7.1 1 to 4 Demultiplexer
- 7.7.2 1 to 16 Demultiplexer

7.8 Encoder
- 7.8.1 Decimal to BCD

7.9 Decoder
- 7.9.1 BCD to Decimal
- 7.9.2 BCD to seven segment

8. Sequential Systems :

8.1 Introduction
8.2 Symbol, logic circuit, truth table of R-S, J-K, M/S J-K,D,T flip-flops
8.3 Edge and level triggering
8.4 Shift registers
- 8.4.1 Left, right and bi-direction
- 8.4.2 Series and parallel
- 8.4.3 Universal shift register

8.5 Asynchronous and synchronous counters - up, down and up-down
8.6 Mod counters - Mod 5, Mod 9, decade counter
8.7 Ring counters, Johnson counter
8.8 Programmable counters
8.9 Use of shift register for simple binary multiplication and division.

PRACTICALS

1. Verify the truth tables of NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates
2. Design a NOT, AND, OR, EX-OR, EX-NOR gates using universal gates
3. Design a binary half and full adder
4. Design a binary half and full subtractor
5. Study of BCD to 7 segment decoder
6. Verify the truth table of RS, D, J-K, M/S J-K,D,T flip-flops.
7. Study of asynchronous binary ripple up, down and up-down and different mod counters
8. Study of synchronous counters
9. Study of decade counter
11. Study of programmable counter
12. Study of a shift register using flip flops
13. Study of ring counter using flip flops

REFERENCE BOOKS :

1. Digital Principles & Applications — Malvino Leach.
2. Integrated Electronics — Millman & Halkias

3.	Digital Electronics	T.C. Bartee
4.	Digital Electronics Practice Using IC's	R.P. Jain.
5.	Modern Digital Electronics	R.P. Jain
6.	Digital Electronics	L. Solanki
7.	Digital Intregrated Circuit	K.R. Botker
8.	Digital Design	Flloyd
9.	Digital Logic Design	Morris Mano.

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BASIC COMMUNICATION ENGINEERING

	L	T	P
CODE EL 36			
CS 36/ EF 36	3	--	2

RATIONALE

For the transmission and reception of signals in industry and domestic life the basic knowledge of communication engineering is essential. The study of the subject provides the basic knowledge of various modulation, demodulation technique which further provide the fundamentals to understands the operation of communication systems. Detailed knowledge of radio receiver is also included in the syllabus.

CONTENTS

1. Introduction :

- 1.1 Basic component of communication
- 1.2 Definition of modulation
- 1.3 Need of modulation in communication
- 1.4 Definition of AM, FM, PM, PAM, PPM, PWM and PCM

2. Noise and Cross Talk :

- 2.1 Classification of noise
  - 2.1.1 Atmospheric noise
  - 2.1.2 Shot noise
  - 2.1.3 Thermal noise
  - 2.1.4 Transit time noise
  - 2.1.5 Miscellaneous noise
- 2.2 Noise figure
- 2.3 Concept of cross talk
- 2.4 Cross-talk elimination techniques

3. Amplitude Modulation :

- 3.1 Derivation of AM wave equation
- 3.2 Modulation index for sinusoidal AM
- 3.3 Frequency spectrum for sinusoidal AM
- 3.4 Total power in AM wave.
- 3.5 Effective voltage and current for sinusoidal AM
- 3.6 BJT collector amplitude modulator
- 3.7 General idea of carrier and sideband suppression
- 3.8 Balance modulator circuits
  - 3.8.1 Using diode
  - 3.8.2 Using FET
- 3.9 SSB generation by filter and phase shift methods
- 3.10 Block diagram of AM transmitter

4. Frequency Modulation :

- 4.1 Derivation of FM wave equation
- 4.2 Modulation index and frequency deviation for FM
- 4.3 Frequency spectrum for sinusoidal FM
- 4.4 FET reactance and varactor diode FM modulator circuits
- 4.5 Block diagram of FM transmitter using direct and indirect method (Armstrong method)

4.6 Comparison of AM and FM system

5. Radio Receivers :

5.1 Various types of receivers
5.2 Receiver characteristics and their measurements
5.3 Electronic tuning system
5.4 AM demodulator - envelope detection, product demodulator (SSB detection circuit)
5.5 FM demodulator - balance slope, Foster Seely and ratio detector circuit
5.6 Block diagram of Super heterodyne AM receiver and circuit of each stage
5.7 Block diagram of FM receiver

PRACTICALS

1. Generation of AM and measurement of the modulation index.
2. Perform the AM demodulation (Envelope detector)
3. Generation of F.M.
4. Operation of standard R.F. signal generator.
5. Measurement of selectivity, sensitivity, fidility of radio receiver
6. Study of F.M. demodulation.
7. Assembling of two band radio receiver.
8. Alignment and tunning of a transistor radio receiver.
9. Fault finding exercise in a radio receiver.

REFERENCES BOOKS :

1. Communication System. George Kannedy.
2. Radio Engg. G.K. Mithal.
3. Electronic Communications. Roddy & Coolen.
4. Carrier Communication N.N. Biswas

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ELECTRONIC INSTRUMENTS

	L	T	P
CODE EL 37			
EF 37	3	--	2

RATIONALE

In order to carry out the preventive maintenance of electronic gadgets, fault location, testing and calibration, knowledge and skill of electronic instruments is essential. The contents of this subject are to cover some of the aspects of electronic instruments.

CONTENTS

1. Performance Characteristics of Measuring Devices and Errors :

- 1.1 Accuracy and precision
- 1.2 Resolution, drift
- 1.3 Linearity and hysteresis
- 1.4 Threshold
- 1.5 Response time and calibration
- 1.6 Repeatability and maintainability
- 1.7 Span
- 1.8 Errors - Gross, Systematic and Random Errors
- 1.9 Sensitivity

2. Multimeter :

- 2.1 Principle of measurement of
  - 2.1.1 D.C. Voltage and current
  - 2.1.2 A.C. Voltage and current
  - 2.1.3 Resistance
- 2.2 Calculation of shunt and multiplier for range extension
- 2.3 AC and D.C. sensitivity
- 2.4 Loading effect
- 2.5 Specifications and limitations of multimeter.

3. Electronic Voltmeter :

- 3.1 Characteristics of different analog electronic voltmeter
- 3.2 Circuits for D.C. voltmeter using BJTs and FETs (single device and balanced bridge type)
- 3.3 Theory and operation of circuits for average, peak, peak to peak and RMS responding A.C. electronic voltmeters
- 3.4 Comparison of amplifier rectifier type and rectifier amplifier type electronic voltmeter

4. Cathode Ray Oscilloscope (C.R.O) :

- 4.1 Construction of CRT and deflection sensitivity
- 4.2 Block diagram of CRO
- 4.3 Various controls of CRO
- 4.4 Detail of X-Y section and delay line
- 4.5 Horizontal sweep section
- 4.6 Synchronization of sweep and triggered sweep
- 4.7 Measurement of voltage, current, frequency and phase angle using CRO
- 4.8 CRO probes
- 4.9 Construction and working of dual trace and dual beam CROs

5. Working Principle and Application of :

- 5.1 Q-meter
- 5.2 AF/RF signal generators
- 5.3 Harmonic distortion analyzers.

5.4 Transistor Tester
5.5 Curve Tracer
5.6 LCR bridge
5.7 Output power meter (AF)

6. Digital Displays :

6.1 Construction and Working Principle of different type of displays. Such as Diode Matrix, 7-segment using LED and LCD, Dot matrix using LED
6.2 Comparison of different type of displays

PRACTICALS

1. Measurement of D.C. voltage and current by multimeter
2. Measurement of A.C. voltage and current by multimeter
3. Measurement of resistance by multimeter
4. Complete study of multimeter and specification.
5. Study of electronic voltmeter
6. Study and use of CRO for voltage, frequency and phase angle measurement
7. Measurement of phase and frequency using lissajous figure by CRO
8. Testing of transistors using transistor tester
9. Study of seven segment display (LED and LCD)
10. Measurement of Harmonic distortions of on Amplifier using harmonic distortions Analyzer
11. Measurement of output power of an Audio Amplifier using AF power meter
12. Measurement of L, C, and R by LCR Bridge/ meter
13. Measurement of Q factor of a coil / capacitor by Q meter

REFERENCE BOOKS :

1. A Course in Electrical and Electronics Measurement & Instrumental — A.K. Sawhney
2. Modern Electronic Instrumentation and Measurement Techniques — Cooper
3. Electronic Instrumentation Fundamentals — Malvino
4. Electronic Measurement — Terman Pettit
5. Electronic Instruments — David Bell

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ELECTRONICS WORKSHOP

CODE EL 41	L	T	P
EF 41	2	--	4

RATIONALE

In the fabrication of any electronic gadget printed circuits and small transformers play very important role, therefore the knowledge of printed circuit board fabrication and transformer making is essential for diploma students. IFTs, coils and impregnation plants and concepts of semiconductor device fabrication in brief are also included in the syllabus.

CONTENTS

1. Printed Circuit Board Fabrication :

- 1.1 Introduction
- 1.2 Types and specification of PCB
- 1.3 Basic steps of fabrication
  - 1.3.1 Master art preparation
  - 1.3.2 Resist Coating (tape resist, resist paint, silk screen, photographic)
  - 1.3.3 Etching technique
  - 1.3.4 Resist removal
  - 1.3.5 Drilling
  - 1.3.6 Lacquer coating
- 1.4 Advantage and limitation of PCB
- 1.5 Safety recommendation
- 1.6 Block diagram of PCB plant
- 1.7 Preparation of PCB art work for
  - 1.7.1 Battery eliminator circuit
  - 1.7.2 Audio amplifier circuit
  - 1.7.3 R.C. phase shift oscillator
  - 1.7.4 Multivibrators (using IC 555, 741)
  - 1.7.5 Half adder and full adder circuits

2. Semiconductor Device Fabrication :

- 2.1 Introduction
- 2.2 Intrirsic semiconductor fabrication
  - 2.2.1 Floating zone apparatus
  - 2.2.2 Crystal pulling apparatus
- 2.3 Semiconductor diode and transistor fabrication
  - 2.3.1 Point contact techniques
  - 2.3.2 Grown junction techniques
  - 2.3.3 Alloy junction techniques
  - 2.3.4 Diffused junction techniques
  - 2.3.5 Epitaxial growth techniques

3. Transformer :

- 3.1 Principle of transformer
- 3.2 Voltage, current and turn ratio relationship
- 3.3 Construction details of following transformers.
  - 3.3.1 Core type
  - 3.3.2 Shell type
  - 3.3.3 Auto transformer

3.4 Design procedure of iron core small transformers and numerical problems
3.5 Constructional details of transformers winding machine .

4. Coils and IFTs :

4.1 Classification of Coils according to frequency range
4.2 Classification of coils according to type of winding
4.3 Important terms related to coils

4.3.1 Skin effect.
4.3.2 Dielectric losses.
4.3.3 Distributed capacitance.
4.3.4 Quality factors.

4.4 Imperical formulae for designing of coils with numerical examples
4.5 Toroids - brief idea
4.6 Intermediate frequency transformer (IFT) -

4.6.1 Construction of IFT
4.6.2 IFT details for radio receiver

5. Impregnation Plants :

5.1 Need of impregnation plant
5.2 Diagram of impregnation plant schematic
5.3 Working procedure of Impregnation Plants.
5.4 Safety precautions
5.5 Limitations and advantages

6. Use and practices of an electronics work bench and circuit maker for basic circuits.

PRACTICALS

1. Study of transformer
2. Study of coil winding machine
3. Familiarization with different type of stampings and bobin
4. To design winding and test small transformer of single and tapped secondary
5. To design winding and test the transformer of multiple secondary
6. Preparing and testing IFT
7. Familiarization with various wires used in coil
8. Winding of two band radio transistor Antenna coils for MW and SW
9. Study of PCB plant equipment
10. To design and prepare PCB using tape resist method
11. To design and prepare PCB using resist paint method
12. To design and prepare PCB using silk screen method
13. To design and prepare PCB using photographic method
14. Study of process camera
15. Fabrication and testing of gadgets as mentioned in article 1.7
16. To design PCB using PC software (circuit maker / Easy PC)
17. Use and practice on electronic work bench for basic electronic circuits.

REFERENCE BOOKS :

1. Coil Winding & Fabrication Practice — K.R. Nahar
2. Transformer & Coil — BPB Publication
3. PCB - Design & Technology — W.C. Bosshort

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ELECTRONIC CIRCUITS

	L	T	P
CODE EL 42			
EF 42	3	--	2

RATIONALE

Electronics equipments in these days mostly uses semiconductor devices. In industries power controlling is also achieved by semiconductor devices, knowledge of each component and different circuit is very essential for operation and maintenance. The subject provides the basic knowledge of principles of electronic circuit.

CONTENTS

1. JFET and MOSFET Amplifiers :

1.1 The common source CS amplifier its A.C. equivalent circuits and voltage gain calculation at low and high frequency
1.2 The common drain CD amplifier its A.C. equivalent circuits and voltage gain calculation at low and high frequency

2. Multistage Amplifier :

2.1 Different types of coupling

2.1.1 Direct coupling
2.1.2 R.C. coupling
2.1.3 Transformer coupling

2.2 Distortion in amplifiers
2.3 Frequency response of an amplifier
2.4 Effect of cascading on gain and bandwidth
2.5 Simple calculation for gain and bandwidth for RC coupled amplifier
2.6 Measurement of input and output impedance of an amplifier
2.7 Square wave testing of an amplifier
2.8 Comparison and application of coupled amplifiers
2.9 Design analysis of a RC coupled amplifier for given parameters

3. Power Amplifier :

3.1 Classification of power amplifier
3.2 Class A large signal amplifier and its analysis for output power
3.3 Second harmonic distortion
3.4 Transformer coupled audio power amplifiers
3.5 Efficiency and conversion efficiency
3.6 Push pull amplifiers
3.7 Class B power amplifier and its efficiency
3.8 Class AB operation and cross over distortion
3.9 Complementary symmetry push-pull amplifier
3.10 Idea of phase inverter

4. Feedback Amplifier :

4.1 Basic concept of feedback
4.2 Classification of feedback amplifier
4.3 Advantages of negative feedback on gain stability, distortion, frequency response, noise reduction, input impedance and output impedance
4.4 Analysis of various Negative feedback amplifier circuits.
4.5 Comparison of negative voltage feedback and negative current feedback

5. Oscillators :

5.1 Positive feedback concept
5.2 Barkhausen criterion

5.3 Working and calculation of frequency (no formula derivation) for Hartley (series and shunt) , Colpitt's, Clapp, tuned collector, R-C phase shift, Wein bridge, Crystal and beat frequency oscillator

6. Tuned Amplifier :

6.1 Need of tuned amplifier and its design consideration
6.2 Classification of tuned amplifier - Single, double and stagger tuned.
6.3 Single tuned amplifier and its analysis
6.4 Double tuned amplifier and its analysis
6.5 Tuned drain amplifier and tuned collector amplifier
6.6 Applications

7. Transistor at High Frequency and Special Circuit :

7.1 High frequency small signal π model of transistor
7.2 Current gain, alpha cut off frequency (f_α)
7.3 f_T , f_β and their relationship
7.4 Darlington pair and bootstrapping
7.5 Cascode amplifier

PRACTICALS

1. Study of JFET amplifier and plot its frequency response
2. Study of depletion and enhancement MOSFET amplifier and plot its frequency response
3. Plot the frequence response of two stage R-C coupled amplifier and measure its bandwidth
4. Plot the frequence response of transformer coupled amplifier
5. Plot the frequency response of direct coupled amplifier
6. Study of transistor push-pull amplifier
7. Study of complimentary transistor power amplifier
8. Study of phase inverter
9. Study of Dartington pair
10. Plot the frequency response of negative feedback amplifier and observe the effect of negative feed back
11. Plot the frequency response of single tuned and double tuned voltage amplifiers
12. Study of Hartley oscillator and calculate frequency of oscillation
13. Study of Colpitt's oscillator and calculate frequency of oscillation
14. Study of RC phase shift oscillator
15. Study of a Wein bridge oscillator and calculate frequency of oscillation.
16. Study of crystal oscillator
17. Study of clapp oscillator

REFERENCE BOOKS :

1. Electronic Devices & Circuits — Millman Halkias
2. Integrated Electronics — Millman Halkias
3. Electronic Devices & Circuits — Allen Mottershed.
4. Electronic Principles — Malvino
5. Electronic Devices & Circuits — Sanjeev Gupta
6. Applied Electronics — G.K. Mithal
7. Electronic Devices & Circuits — Mathus, Kulshresta & Chadda

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PULSE AND WAVE SHAPING CIRCUITS

	L	T	P
CODE EL 43 / EF 43	3	--	2

RATIONALE

Communication instruments as well as digital instruments require digital pulses, different waveforms, various types of other circuits such as filters, attenuator, time-base generators. This syllabus helps students to under stand the basic principle of liner and non liner wave shaping and non sinusoidal wave form generation.

CONTENTS

1. Linear Wave Shaping Circuits :

- 1.1 R-C circuit as high pass and low pass circuit
- 1.2 High pass circuit as a differentiator
- 1.3 Response for step, pulse and square wave input
- 1.4 Calculation of percentage tilt
- 1.5 Low pass circuit as an integrator
- 1.6 Calculation of Rise time
- 1.7 Response of low pass circuit for step, pulse and square wave input

2. Non Linear Wave Shaping :

- 2.1 Various clipping circuits using ideal diode
- 2.2 Transfer characteristics
- 2.3 Transistor clippers
- 2.4 Clamping circuit and its application as a staircase wave form generator
- 2.5 Clamping circuit theorem

3. Multivibrator :

- 3.1 Transistor as a switch and Switching times.
- 3.2 Bistable Multivibrator (BMV)
  - 3.2.1 Fixed bias and self bias BMV and their working
  - 3.2.2 Calculation of voltage at different points in fixed bias BMV
  - 3.2.3 Symmetrical and unsymmetrical triggering
  - 3.2.4 Working of Schmitt trigger
  - 3.2.5 Hysterisis elimination
- 3.3 Monostable Multivibrator (MMV)
  - 3.3.1 Working of MMV (collector coupled)
  - 3.3.2 Calculation of time duration
  - 3.3.3 Wave shape at different points and calculation of voltage at different points
  - 3.3.4 Working of emitter coupled MMV
  - 3.3.5 Comparison of collector coupled MMV with emitter coupled MMV
- 3.4 Astable Multivibrator (AMV)
  - 3.4.1 Working of collector coupled AMV
  - 3.4.2 Wave shapes at different points
  - 3.4.3 Working of emitter coupled AMV
  - 3.4.4 Calculation of free running frequency for collector coupled AMV
  - 3.4.5 Comparison of collector coupled with emitter coupled AMV
- 3.5 Application of Multivibrators

4. Blocking Oscillator :

4.1 Need of blocking oscillator
4.2 Working of Mono stable and Astable Blocking oscillator and their wave shape at different points :
4.3 Blocking oscillator as sawtooth generator
4.4 Calculation of pulse repeating frequency
4.5 Synchronization of blocking oscillator

5. Time Base Generators (Sweep circuits) :

5.1 Need of time base generator
5.2 General features of time base signals
5.3 Methods of generating time base waveforms
5.4 Principle and working of Miller sweep and bootstrap sweep time base generating circuit

PRACTICALS

1. Design a RC high pass filter for a given frequency

1.1 Plot its frequency response
1.2 Measures the percentage tilt
1.3 Observe it as a differentiator (for different time constant)

2. Design a RC low pass filter for a given frequency

2.1 Plot its frequency response
2.2 Measure its rise time
2.3 Observe it as an integrator (for the different time constant)

3. Observe the wave forms of various clipping circuit
4. Observe the wave forms of various clamping circuits
5. Study of Bistable multivibrator and measure voltages at different points
6. Observe the voltage wave forms at different points of MMV and measure its pulse width.
7. Observe the voltage waveforms at different points of AMV and measure its free running frequency.
8. Observe the output wave form of a schmitt trigger and measure LTP and UTP.
9. Observe the output waveform of a staircase generator
10. Observe the waveform of a blocking oscillator.
11. Observe the waveform of a transistorized Sweep circuit.

REFERENCE BOOKS :

1. Pulse & Wave Shaping Circuits. Millman & Taub.
2. Pulse Circuits Rajul Singhal
3. Pulse & Digital Circuits K.K. Agarwal
4. Electronic Devices & Circuits G.K. Mithal
5. Wave Shaping & Digital Circuits Agarwal & Rai

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DIGITAL INSTRUMENTS

	L	T	P
CODE EL 44			
EF 44	3	--	2

RATIONALE

In the modern era most of the measurements are performed by digital instruments due to their merits over analog instruments, therefore the knowledge of basic principles of operation of these instruments is essential for electronics diploma holder.

CONTENTS

1. Introduction :

1.1 Comparison of analog and digital instrument

2. Converters :

2.1 D/A converter

2.1.1 Resistive divider
2.1.2 Ladder type

2.2 A/D converter

2.2.1 Simultaneous A/D
2.2.2 Ramp type
2.2.3 Integrating type
2.2.4 Dual slope type
2.2.5 Successive approximation type

3. Digital Voltmeter (DVM) :

3.1 Types of digital voltmeter

3.1.1 Ramp DVM
3.1.2 Integrating DVM
3.1.3 Successive approximation DVM

3.2 General characteristics of DVM
3.3 Advantage of DVM
3.4 Automation in DVM

3.4.1 Automatic polarity indication
3.4.2 Auto ranging
3.4.3 Auto zeroing

3.5 Organisation of digital parts of DVM

4. Digital Multimeter :

4.1 DC voltage attenuator
4.2 Current to voltage convertor
4.3 AC/DC convertor
4.4 Resistance to voltage convertor
4.5 HF to LF voltage converter
4.6 Accuracy of DMM

4.6.1 Sources of errors in D.C. voltage measurement
4.6.2 Sources of errors in DC/AC currents
4.6.3 Sources of errors in AC/DC conversion

4.7 RMS detector in DMM and DMM specifications

5. Digital Frequency Counter :

5.1 Block diagram and working

5.1.1 Basic circuit
5.1.2 Time base
5.1.3 Start stop gate

5.2 Errors in measurements
5.3 Block diagram of universal counter

5.3.1 Measurements of period, frequency, time interval and ratio

6. General Purpose Digital Instruments :

6.1 Basic block diagram, working and applications of -

6.1.1 Signal generator
6.1.2 Function generator
6.1.3 Digital storage CRO
6.1.4 Digital phase meter
6.1.5 Logic analyser
6.1.6 Signature analyser
6.1.7 Logic probe
6.1.8 Logic pulser

7. Guarding Techniques:

7.1 Safety guard and signal ground.
7.2 Ground loops and ground currents.
7.3 Common mode and series mode voltage.
7.4 Avoiding parasitic voltage.

PRACTICALS

1. Assembling and Testing of 3/4 bit DAC using Resistive network divider
2. Assembling and Testing of 3/4 bit DAC using resistive ladder network
3. Design of 2/3 bit simultaneous type A/D converter
4. Study of Ramp type A/D converter
5. Study of Successive Approximation type ADC
6. Study of different digital multimeters
7. Measurement of current, voltage and resistance by digital multimeters
8. Study of logic probes
9. Study and operation of digital frequency counter
10. Study of digital IC tester and testing of IC
11. Study and operation of logic analyser
12. Study and operation of signature analyser

REEFERENCE BOOKS :

1. Digital Instrumentation — Bouwen
2. Electronic Instrumentation — Kalsi
3. Electronic Measurement & Instrumentation — A.K. Sawhni
4. Electronic Measurement & Instrumentation — Cooper Helfric

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INSTRUMENTATION AND CONTROL SYSTEM

	L	T	P
CODE EL 45			
EB45/ EF 45	3	--	2

RATIONALE

Instrumentation can be defined as the science and technology of measurement, analysis, recording, telemetering, control and display. This course aims at imparting the basic concepts of instrumentation and control system. As measurement forms the backbone of all scientific and technological research work the need for instrumentation and control in industrial environment is tremendous. The industrial processes are becoming more and more complex day by day. The requirements of instrumentation engineers are also increasing. Therefore it is appropriate to introduce a course such as instrumentation and control to diploma students which will expose the students to the field of instrumentation and control, where they are taught primary sensing elements, transducers, signal conditioning, basic control theory and recent advances in field of instrumentation and control. It will help the nation in generating the trained man power resources for the above field

CONTENTS

1. Basic Concept of Measurement :

1.1. Introduction.
1.2. Generalized configuration of measuring system.
1.3. Characteristics of measuring devices

- 1.3.1. Accuracy.
- 1.3.2. Resolution.
- 1.3.3. Precision.
- 1.3.4. Expected Value.
- 1.3.5. Error (Gross, Systematic and Random error).
- 1.3.6. Sensitivity.
- 1.3.7. Linearity.
- 1.3.8. Hysterisis.
- 1.3.9. Repeatability.
- 1.3.10. Threshold

1.4. Calibration of measuring devices.

2. Transducers :

2.1 Concept of Primary and Secondary transducers.
2.2 Difference between active and passive transducer.
2.3 Difference between analog and digital transducer.
2.4 Construction and working of the following transducers and measurement of quantities such as Displacement (Linear and angular), Strain, Stress, Temperature, Pressure, Flow level, pH value.

- 2.4.1 Potentiometers
- 2.4.2 Strain gauge (resistance and semiconductor type)
- 2.4.3 Resistance Temperature detectors (RTD)
- 2.4.4 Thermo couples, thermistor.
- 2.4.5 Linear variable differential transformer (LVDT).
- 2.4.6 Capacitive transducer
- 2.4.7 Load Cell
- 2.4.8 Piezo Electric Transducer
- 2.4.9 Photo Cells
- 2.4.10 Photo Voltaic Cell
- 2.4.11 Techogenerator
- 2.4.12 Ultrasonic method for level measurement
- 2.4.13 Electro magnetic flow meter.
- 2.4.14 pH electrodes

3. Signal Conditioning :

3.1 Introduction.
3.2 DC Signal Conditioning.

3.3 AC Signal Conditioning.
3.4 Brief idea of data acquisition system

4. Control System :

4.1 Concept of open loop and close loop system
4.2 Automatic control system
4.3 Transfer function
4.4 Block diagram reduction techniques
4.5 Concept of feedback control and its effects

5. Control System Components :

5.1 Working principle and construction of -

5.1.1 Synchro Transmitter
5.1.2 Synchro receiver
5.1.3 Control transformer
5.1.4 DC and A.C. servo motors

5.2 Characteristics of servo amplifier for A.C. and D.C. error signals

6. Position Control System :

6.1 Introduction.
6.2 Study position control in small/large system with the help of block diagrams of -

6.2.1 Pen recorder
6.2.2 Real drive
6.2.3 Machine tool control
6.2.4 Level Control
6.2.5 Temperature Control

PRACTICALS

1. To measure the linear and angular displacement by

1.1 LVDT.
1.2 Potentiometer.
1.3 Capacitive transducer.

2. Measurement of speed of the shaft by contact and non contact methods.

2.1 Photo electric transducer.
2.2 Magnetic transducer
2.3 Techogenerator

3. Measurement of force by strain gauge bridge
4. Measurement of pH value using pH meter
5. Error detection by synchro pair
6. Measurement of temperature and draw the characteristics of following -

6.1 Thermocouple.
6.2 RTD
6.3 Thermister

7. To draw the torque and speed curve for servo motor.
8. Measurement of level by capacitive transducer.
9. To observe the output wave form of synchro transmitter on CRO and find the electrical zero.

REFERENCE BOOKS :

1. Automatic Control System B.C. Kuo.

2.	Control System Engineering	I.J. Nagrath & Gopal
3.	A Course in Electrical & Electronics Measurement & Instrumentation.	A.K. Shawney.
4.	Instrumentation Measurement and Feed Back	Barry E Jones.
5.	Instrumentation Devices and System	C.S. Ranga, Sharma, Mani.
6.	Instrumentation.	R.K. Jain.
7.	Control Engineering	N.M. Morris
8.	Measurement Systems Application & Design.	E.O. Deoblin.
9.	Electronic Instruments	Helpric Cooper

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TRANSMISSION LINES AND WAVE PROPAGATION

	L	T	P
CODE EL 46			
EF 46	3	2	--

RATIONALE

The introduction of this subject for diploma holders to provide them the basic ideas about EM theory and the fundamental principles of transmission line, wave propagation and antennas.

CONTENTS

1. Electromagnetic Theory :

1.1. Maxwell's Equations.
1.2. Electromagnetic Wave Equation for free space.
1.3. Propagation of uniform plane wave.
1.4. Reflection Refraction and polarisation of electromagnetic waves. (Simple description - no derivation)

2. EM Wave Propagation :

2.1. Ground Wave propagation and effect of curvature of the earth.
2.2. Space Wave Propagation

2.2.1. Line of sight distance.
2.2.2. Effect of Atmosphere and Obstacles. (no derivation)

2.3. Sky Wave Propagation

2.3.1. Ionospheric and its characteristics
2.3.2. Critical frequency
2.3.3. Effect of the Earth's magnetic field on ionospheric propagation
2.3.4. MUF and Skip distance.
2.3.5. Ionospheric absorption and disturbances.
2.3.6. Atmospheric noise.
2.3.7. Scatter propagation.
2.3.8. Fading of Radio Waves. (no derivation)

3. Transmission Lines :

3.1. Fundamentals of Transmission Line

3.1.1. Transmission Line Equation.
3.1.2. Characteristic Impedance.
3.1.3. Terminated Loss-less Line.
3.1.4. Standing Wave Ratio V.S.W.R. and its measurement
3.1.5. Behaviour of quarter and half wave line

4. Antennas :

4.1. Principle of Radiation.
4.2. Resonant and non resonant antennas.
4.3. Radiation Pattern of $\lambda/2$, λ and $3\lambda/2$ dipoles. Effect of ground on $\lambda/2$ dipole.
4.4. Radiation pattern of grounded $\lambda/4$, $\lambda/2$, and λ dipole.
4.5. Radiation resistance, total resistance, efficiency, beam width, gain, aperture area of an antenna. (no derivation)
4.6. Antenna Array -

4.6.1. Principle of Pattern Multiplication
4.6.2. Broad Side array
4.6.3. End Frire array

4.7. Folded dipole and Rhombic antenna.
4.8. Yagi antenna and parasitic elements

4.9. Log Periodic and Loop antenna.
4.10. Parabolic antennas and Horn antenna
4.11. Measurement of antenna impedance and field pattern

REFERENCE BOOKS :

1.	Electronic Communication System	Kennedy
2.	Radio Engineering	Terman
3.	Electro Magnetic Waves and Radiating Systems	Jordan Balman.
4.	Antennas	Kraus
5.	Radio Engineering	G.K Mithal
6.	Antenna & Wave Propagation	KD Prasad
7.	Transmission Lines & Networks	Umesh Sinha

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MICROPROCESSOR

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CODE EL 47			
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RATIONALE

The development of semiconductor technology has revolutionized the branch of electronics, starting from small scale integrated circuit (SSI), where the complete C.P.U on a single chip which is known as microprocessor has changed the concept of automation as well as has proved itself as a very cost effective and reliable, alternate for automation. Due to this reason the computers and microprocessor based equipment's are invading into every walk of life. In advance technology of electronics field it must be necessary the knowledge of microprocessors and their application for the students of electronics, where the students exposed to the concept of microprocessor programming, interfacing and designing of microprocessor based system.

CONTENTS

1. Introduction :

- 1.1 Microprocessor concept
- 1.2 Historical review of microprocessor development
- 1.3 Organization of a micro computer

2. The 8085 Architecture :

- 2.1 Internal block diagram
- 2.2 8085 signals and their functions
- 2.3 Demultiplexing of buses
- 2.4 Pin configuration and logical diagram.

3. 8085 Instructions and Programming :

- 3.1 Instruction format
  - 3.1.1 Mnemonics
  - 3.1.2 Opcode and operand
  - 3.1.3 Instruction length
- 3.2 Classification of instruction
  - 3.2.1 Data transfer
  - 3.2.2 Arithmetic
  - 3.2.3 Logical
  - 3.2.4 Branching
  - 3.2.5 Machine control
- 3.3 Different interrupts of 8085 Microprocessor
- 3.4 Addressing modes
- 3.5 Stack operation and related instructions
- 3.6 Subroutine and related instructions
- 3.7 Machine and assembly language
- 3.8 Assembly language programming
- 3.9 Debugging of programs

4. Memory and I/O System :

- 4.1 Memory types
- 4.2 Memory organization
- 4.3 Basic concept of memory interfacing and I/O interfacing
- 4.4 Difference between peripheral I/O and memory mapped I/O

5. Instruction Execution and Timings :

5.1 Instruction cycle - machine cycle, T-states
5.2 Fetch cycle
5.3 Memory read and write cycle
5.4 I/O read and write cycle
5.5 Interrupt acknowledge cycle
5.6 Bus idle cycle
5.7 DMA cycle
5.8 Machine cycle with wait states.
5.9 Programs using delays and counters

6. Limitation of 8 bit Microprocessor.

PRACTICALS

1. Study of 8085 microprocessor kit
2. Addition of two 8 bit numbers with and without carry
3. Subtraction of two 8 bit numbers with and without borrow
4. Multiplication of two 8 bit number using successive addition and resistor shifting method
5. Program to find out square of a number.
6. Programs involving data arrays

   6.1 Generating odd numbers.
   6.2 Data transfer schemes
   6.3 Sorting of odd/even numbers.
   6.5 Finding largest and smallest numbers.
   6.6 Arrange data array in ascending / descending order

7. Programs using stack
8. Programs using subroutine.
9. Debugging of programs using single stepping on kit

REFERENCE BOOKS :

1. Microprocessor Architecture, Programming & Application — Gaonkar
2. Fundamentals of Microprocessors & MicroComputers — B.Ram
3. Assembly Language Programming — A.Leventhal, Osborn
4. Theory & Problems of Microprocessor Fundamentals — Tokhein
5. Microprocessor & Peripheral Hand book — INTEL
6. Computer Architecture & org. — J.P Hayes
7. Digital Computer Fundamentals — T.C.Bartee
8. An Introduction to Microprocessors — A.P.Mathur

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